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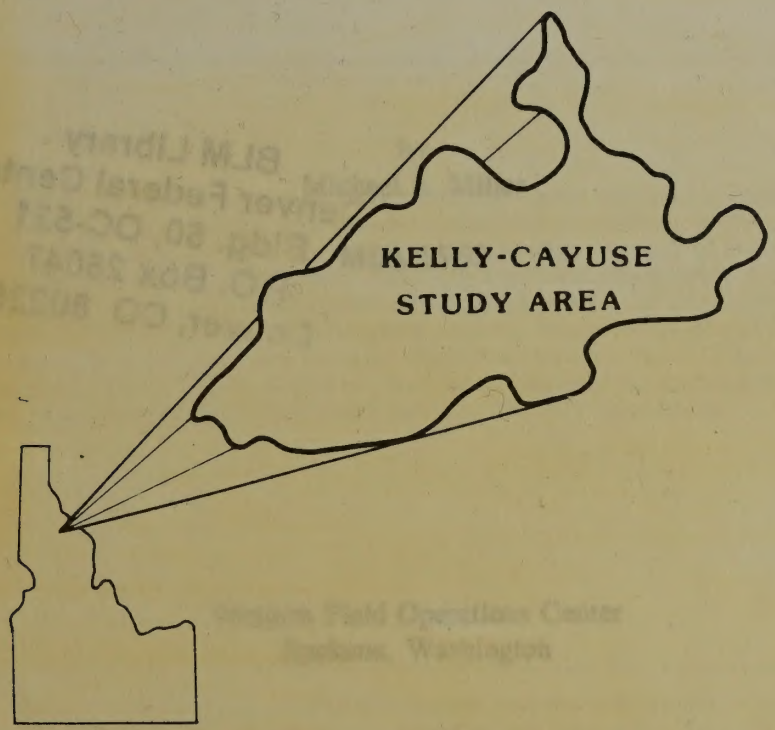

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MINERAL RESOURCES OF THE KELLY-CAYUSE STUDY AREA, SHOSHONE, CLEARWATER, AND IDAHO COUNTIES, IDAHO, INCLUDING PORTIONS OF HOODOO, MOOSE MOUNTAIN, BIGHORN-EAST WEITAS, AND WEIR-POST OFICE CREEK ROADLESS AREAS

by
Michael S. Miller

MLA 15-92

Western Field Operations Center
Spokane, Washington

UNITED STATES DEPARTMENT OF INTERIOR
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16. Abstract (Limit: 200 words)

The Bureau of Mines conducted mineral investigations in the 464,000-acre Kelly-Cayuse study area of Idaho during 1990 and 1991. Approximately 1,100 mining claims have been located in or adjacent to the study area; about 460 are current and nine others patented. At least 1,700 ounces of gold and 290 ounces of silver have been produced from placers in or adjacent to the study area. During the Bureau investigation of specific sites, 504 rock and alluvial samples were collected to delimit mineralization. Subeconomic lode resources of gold exist at the Driessel prospect. A new gold occurrence was found near Shale Mountain, at a mineralized area discovered by the Idaho Geological Survey. Small-scale suction dredging of placer gold is occurring; resources of placer gold that would be marginally economic for large-scale dredge mining occur along Moose Creek and North Fork Clearwater River. Other occurrences of gold, silver, copper, lead, zinc, garnet, titanium, rare-earth elements, silica, stone, limestone, and dolostone are not economic. Sand and gravel will be mined locally for road metal. Hot springs occur in the Weir-Post Office Creek Portion of the study area.

17. Document Analysis a. Descriptors

Mineral deposits; gold; silver; copper; lead; zinc; iron; titanium; antimony; arsenic; potassium; uranium; thorium; geothermal springs; hot springs; caldera; graben; Tertiary volcanic rocks, gravel, and granite; tactite; skarn; tonalite; quartz syenite; breccia; quartzite; quartz veins; silica enrichment; clay enrichment, silicic and argillic alteration; limonite and hematite enrichment; chlorite, epidote, nontronite; sulfides; pyrite; stibnite; chalcopyrite; tetrahedrite; magnetite; rutile; ilmenite; monazite; zircon; scheelite; woframite(?); thrust fault; high-angle fault; low-angle fault.

b. Identifiers/Open-Ended Terms

Idaho and Montana States; Shoshone, Clearwater; Idaho Counties, Mineral and Missoula Counties; St. Joe, Moose Creek, North Fork Clearwater, Oxford, Pierce City, Musselshell, Blacklead, Cedar Creek, and Lolo mining districts; North Fork Clearwater and Lochsa Rivers; Orogrande, Hemlock, Weitas, Fourth of July, Junction, Kelly, Cayuse, Independence, Moose, Osier, Toboggan, Boulder, and Crooked Fork Creeks; Pot, Moose, Blacklead, and Shale Mountains; Rhodes Peak; Hanson Ridge; Hoodoo, Granite, and Lolo Passes.

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PREFACE

The Wilderness Act (Public Law 88-577, September 3, 1964) and related acts require the U.S. Bureau of Mines and U.S. Geological Survey to investigate certain Federal lands "...to determine the mineral values, if any, that may be present..." Results must be made available to the public and be submitted to the President and the Congress. This report presents the results of a Bureau of Mines mineral investigation of the Kelly-Cayuse study area, which includes portions of the Hoodoo (1301), Moose Mountain (1305), Bighorn-Weitas (1306), and Weir-Post Office Creek (1308) Roadless Areas (RARE II), variously classified or recommended as Wilderness, Special Management, or Non-Wilderness by the U.S. Forest Service or Congressional proposal. Mining-related activities would be affected by Wilderness or Special Management designations.

This open-file report contains data gathered and interpreted by personnel of the U.S. Bureau of Mines, Western Field Operations Center, Branch of Resource Evaluation, East 360 Third Avenue, Spokane, WA 99202. This report has been edited and approved by the Branch of Mineral Land Assessment, Washington, DC.

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UNIT OF MEASURE ABBREVIATIONS USED IN THIS REPORT

°C	degree Celsius
°F	degree Fahrenheit
$/yd^3	dollar per cubic yard
ft	foot
in.	inch
mi	mile
oz	troy ounce
oz/yd^3	troy ounce per cubic yard
oz/ton	troy ounce per ton
ppb	part per billion
ppm	part per million
%	percent
yd^3	cubic yard

SUMMARY

In 1990 and 1991, the U.S. Bureau of Mines conducted a study of the 464,000-acre Kelly-Cayuse area to appraise the mineral resources. The area is about 40 miles east of Orofino, Idaho, in the eastern part of the Clearwater National Forest. Gold was discovered at Shale Mountain as a result of this study.

The study area is underlain by Precambrian-age metasedimentary rocks, schist, and gneiss; and by igneous rocks of the Cretaceous- to Eocene-age Idaho batholith. Volcanism and caldera or graben formation occurred. High- and low-angle faults have displaced the rocks, prepared some for mineralization, and guided mineralizing fluids.

Approximately 1,100 mining claims have been located in or adjacent to the study area; about 460 are current and nine others patented. The patented claims and most of the active mining locations are in the Moose City vicinity, along North Fork Clearwater River, near Kid Lake, near Blacklead Mountain, near Papoose Saddle, and near Shale Mountain. Other mineralized sites were also investigated.

The study area had little mineral production but a long mining history dating back to the 1860's. At least 1,700 oz of gold and 290 oz of silver have been produced from placers adjacent to or in the study area. Along Moose Creek, 0.02 to 0.1 oz of gold per hour is being recovered by several, small-scale, suction-dredge miners. Traces of mercury, ilmenite, rutile, and garnet occur in the gold-bearing gravels but are not economic. Large-scale mining of about 20.8 million cubic yards containing about 0.003 oz of gold/yd^3 along Moose Creek and North Fork Clearwater River would be marginally economic because of low grade and expenses related to environmental protection. However, the small-scale mining of these placers can be expected to continue.

Lode sites contained no identified mineral resources; however, additional prospecting is warranted in four regions for gold in veins and in disseminations: Moose City, Hanson Ridge, Rhodes Peak, and Snowbird mine.

Near Moose City, seven of nine samples from schist, gneiss, and quartz veins in the vicinity of the Lost Cabin claims along Deadwood Ridge contained as much as 535 ppb (parts per billion) gold. Quartzite samples near the mouth of Little Moose Creek contained 258 ppb gold.

At the Driessel prospect on Hanson Ridge, silicified granitic rock contains gold. Ten samples of the mineralized zone all contained gold, an average of about 0.1 troy ounce per ton in a subeconomic, inferred, 165,000-ton resource.

The Rhodes Peak graben is significantly mineralized. At Blacklead Mountain prospects, granitic rocks, porphyritic dikes, porphyritic igneous breccias, marble, and tactites contain limonite, pyrite, and magnetite. Samples contained noneconomic maximums of 295 ppb gold, 37 ppm (parts per million) silver, 1.1 percent copper, 1.5 percent arsenic, and 4 percent manganese. Small magnetite and marble lenses occur. At the New Red Lead

prospect, north of Blacklead Mountain, samples contained as much as 43 ppb gold and 4.9 ppm silver. The E. and R. Toughluck prospect, southeast of Blacklead Mountain, has thin, pyrite-rich, shear zones. Samples from there contained as much as 3,725 ppb gold and 260 ppm silver. Samples anomalous in molybdenum and lead and containing small amounts of gold occur in the vicinity of an eroded, brecciated, volcanic neck(?) along Crooked Fork near the historic Fetch claims. Coarse, silicified, limonitic breccia occurs northwest of Shale Mountain. Samples contained as much as 785 ppb gold. Anomalous disseminations and high-grade veins containing antimony, silver, mercury, gold, copper, and lead occur on the Little Papoose claims.

The Snowbird mine yielded 6,500 tons of fluorite. Coarse crystals and masses of quartz, calcite, ankerite, fluorite, and limonitic breccia occur in an extensive, complex vein. Parisite, a cerium fluorocarbonate mineral containing radioactive thorium, is also present.

Samples of the calc-silicate breccia of the Wallace Formation near Admiral Peak contained anomalous, but noneconomic, rare-earth elements including lanthanum (795 ppm), cerium (2,100 ppm), and yttrium (410 ppm).

Thermal springs along Lochsa River at Weir Creek Hot Springs and Colgate Warm Springs were not formally classified because of a lack of data about the thermal reservoirs. These springs would be adequate for direct, domestic heating, but those markets are distant. Few indications of epithermal mineralization were found in the vicinity of the thermal springs.

Nonmetallic mineral localities, including silica, marble, stone, and sand and gravel are too low grade or too far from markets to be utilized. Local use for road building will continue.

INTRODUCTION

This report describes the USBM (U.S. Bureau of Mines) investigation of the Kelly-Cayuse study area. This investigation was conducted between 1990 and 1992 with the IGS (Idaho Geological Survey) and USGS (U.S. Geological Survey). The purpose of this work, initiated at the request of the Idaho congressional delegation, was to provide mineral resource information. Although the immediate goal of this and other USBM mineral surveys is to provide data for the President, Congress, government agencies, and the public for land-use decisions, the long-term objective is to ensure that the nation has an adequate and dependable supply of minerals at a reasonable cost. Results will be used during determinations of suitability of public lands for Wilderness or Special Management designation.

The USBM examined mines, prospects, claims, and mineralized areas, and evaluated identified mineral and energy resources in the Kelly-Cayuse study area. The IGS developed a geologic base map and reported locations of prospects and mineralized areas. The USGS evaluated potential for undiscovered resources based on geological, geochemical, and geophysical surveys.

Commodities investigated included gold (lode and placer), silver, copper, lead, zinc, iron, fluorine, titanium, antimony, rare-earth elements, silica, garnet, stone, sand and gravel, and geothermal energy.

A separate study of the Mallard Larkins area (including Pot Mountain), adjacent and northwest of the Kelly-Cayuse study area, was performed concurrently (Causey, 1992, in preparation).

Geographic Setting

The Kelly-Cayuse study area, encompassing about 464,000 acres of the Clearwater National Forest, is in northern Idaho's Shoshone, Clearwater, and Idaho Counties, about 40 air-miles east of Orofino, Idaho (fig. 1). The study area includes portions of the Hoodoo (RARE II 1301; 149,147 acres in Idaho -- 98,500 acres in Montana were not studied), Moose Mountain (RARE II 1305; 21,393 acres), Bighorn-Weitas (RARE II 1306; 235,510 acres), and Weir-Post Office Creek (RARE II 1308; 22,605 acres) roadless areas. Nine other roadless areas (fig. 2) adjoin the Kelly-Cayuse study area. Wild-and-Scenic-River status has been proposed for North Fork Clearwater River; Lochsa River has already been so designated.

Principal road access to the south side of the study area is the Lolo Trail Road (Lewis and Clark Trail), FS (Forest Service) number 500; this is reached from U.S. Highway 12 between Lewiston, Idaho, and Missoula, Montana. The north side of the study area is accessed by FS and county roads, which are partly paved, between Orofino, Idaho, and Superior, Montana: these include FS roads 247, 250, and 255. These roads are primary access along North Fork Clearwater River and Moose Creek. FS road 581, along Toboggan Ridge, connects the North Fork Clearwater and Lolo Trail Road. Access to the west side of the area is along FS roads 103 and 555. The east side is accessible by FS trails and roads from Montana. FS road 7743 is access from Montana to the Kid Lake area, and FS road 9992 is access to Granite Pass from Lolo Hot Springs. Branch roads, pack trails, and hiking trails lead to the interior of the study area. Reports about condition of trails and roads should be obtained from the Forest Service.

Nearby small towns include Headquarters, Pierce, and Weippe (respectively 10, 5, and 15 mi to the west, in Idaho), Superior, Montana (15 mi to the north), Lolo Hot Springs, Montana (12 mi to the east), Powell, Idaho (7 mi to the southeast), and Lowell, Idaho (20 mi to the southwest).

The study area is in the Bitterroot Mountain Range. The highest point is 7,930 ft at Rhodes Peak; the lowest point is about 2,250 ft, along North Fork Clearwater River at the mouth of Orogrande Creek. Ridges and stream bottoms are narrow and winding. Slopes are steep; hillsides locally slope 1,000 to 1,500 ft per mi. Cayuse Creek, Fourth of July Creek, Gravey Creek, Kelly Creek, Monroe Creek, Moose Creek, North Fork Clearwater River, and Weitas Creek are the major drainages.

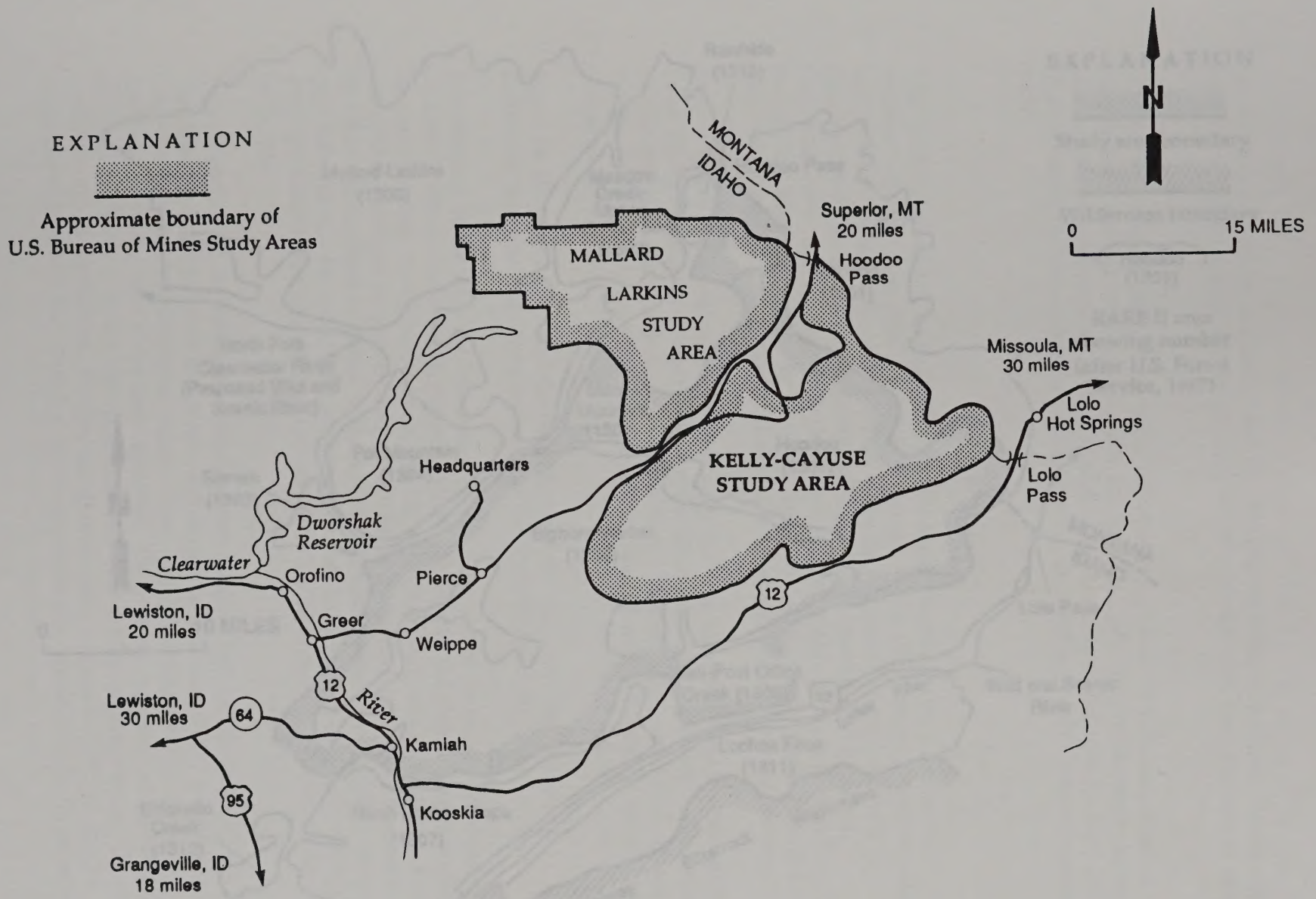
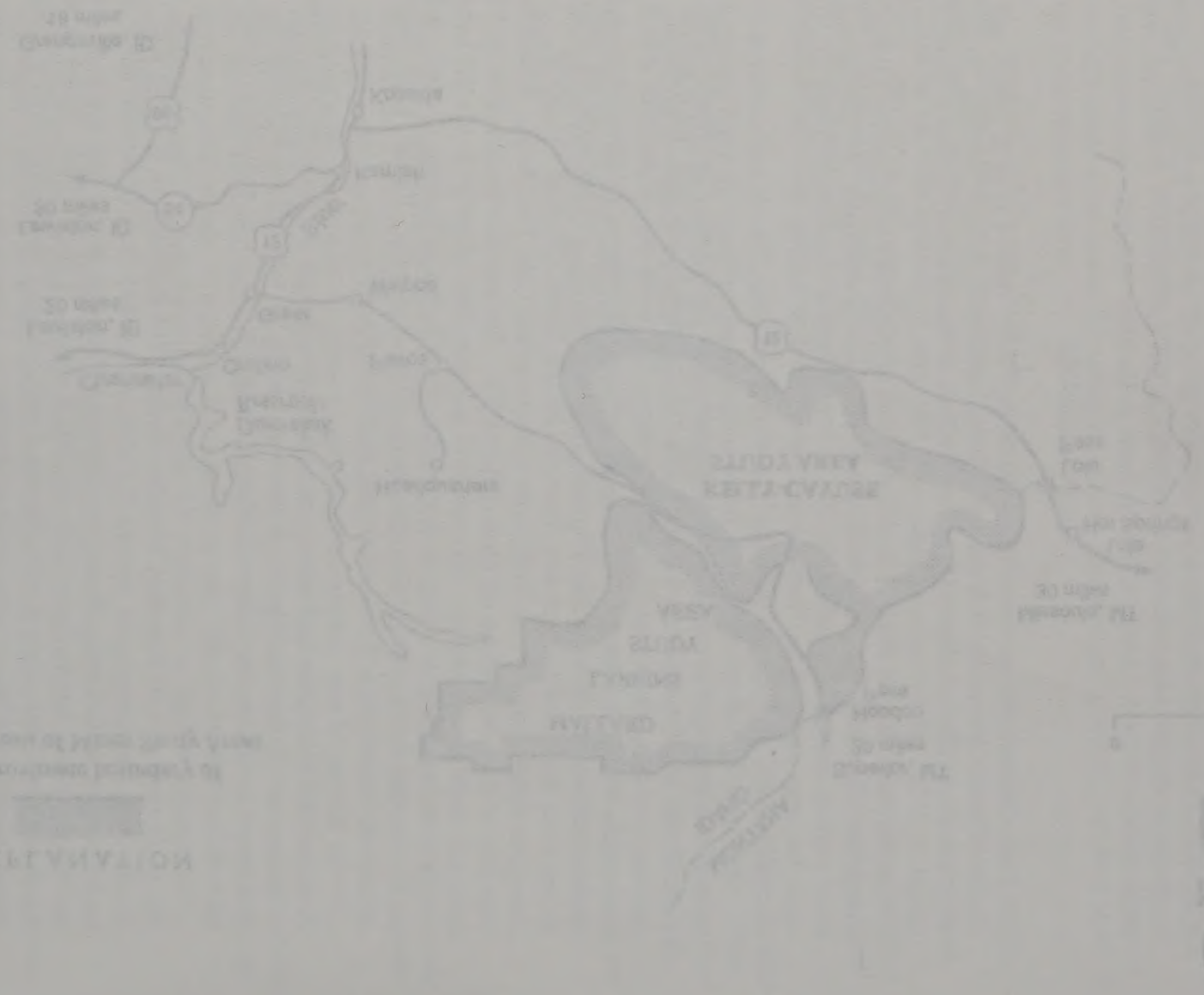


Figure 1.- Location of the Kelly-Cayuse study area, Shoshone, Clearwater, and Idaho Counties, Idaho



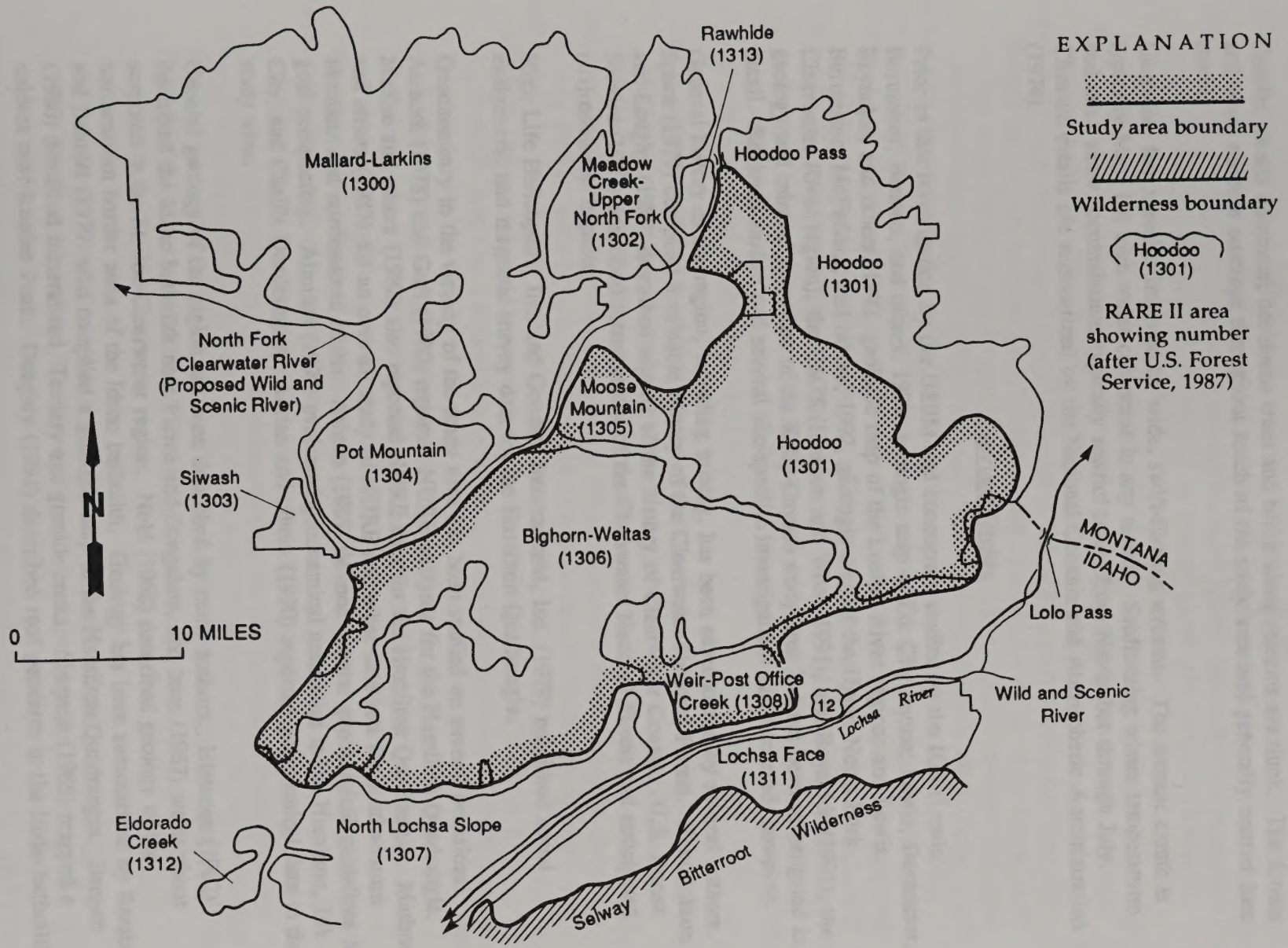
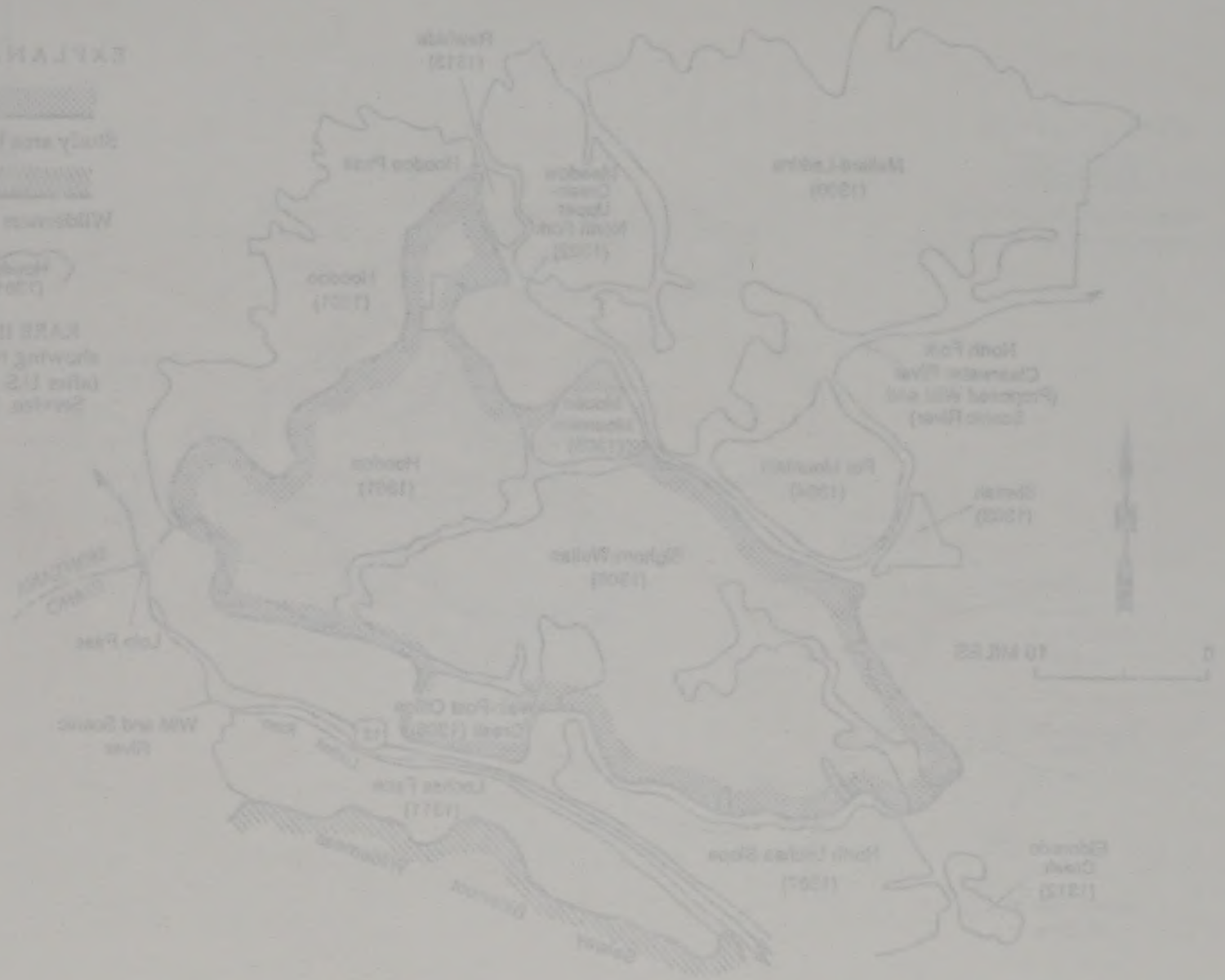


Figure 2.- Roadless areas (RARE II) in the vicinity of the Kelly-Cayuse study area, Shoshone, Clearwater, and Idaho Counties, Idaho



Conifer forests dominate; deciduous trees and brush along streams are thick. The forests and brush obscure outcrops throughout much of the study area and generally restrict foot travel.

Likewise, foot travel is impeded by wide, swift-flowing streams. The wettest month is typically May, but high water can occur in any month. Subfreezing winter temperatures and thick snow accumulations typically restrict travel from November through July. Climatic details are summarized by the National Oceanic and Atmospheric Administration (1974).

Previous Studies

Prior to this investigation by the USBM and concurrent studies by the IGS (Lewis, Burmester, Bennett, and others, 1992, geologic map of Elk City region; Lewis, Burmester, Reynolds, and others, 1992, geologic map of the Lochsa River region; and Lewis, Burmester, McFaddan, and others, 1992, geologic map of the Upper North Fork Clearwater River region), the USGS (Johnson and Worl, 1991), and Reynolds (1991), the geology and mineral resources of the Kelly-Cayuse study area had not been investigated in detail. Regional studies and several site-specific investigations had occurred, however.

General history of the region, including mining, has been summarized by several authors. Space (1979) compiled a valuable history of the Clearwater National Forest. Hendrickson and Laughy (1989) described aspects of the history of Clearwater County. U.S. Forest Service (1987) described management of the Clearwater National Forest and anticipated environmental impacts.

High Life Helicopters, Inc. and Geodata International, Inc. (1979) published aerial radiometric and magnetic survey data for the Hamilton Quadrangle.

Geochemistry in the vicinity of the study area has been studied on several occasions. Aamodt (1978) and Goff (1980) reported NURE analyses for the Hamilton Quadrangle. McKee and others (1982) also reported NURE data for the Hamilton Quadrangle. Madson and others (1983) did an over-all study of NURE and other data sets for southwestern Montana and northeastern Idaho. Ashton (1989) defined general geochemical guidelines for gold prospecting. Alminas (1990) evaluated geochemical anomalies in the Hamilton, Elk City, and Challis Quadrangles. Adrian and others (1990) reported geochemical data in the study area.

General geology of the region has been described by many authors. Hietanen (1962) described the Idaho batholith near Pierce and Bungalow, and later (1967) wrote about scapolite in the St. Joe-Clearwater region. Nold (1968) described geology of the northeastern border zone of the Idaho batholith. Geology has been summarized by Rember and Bennett (1979) who compiled a geologic map of the Hamilton Quadrangle. Bennett (1980) described mineralized, Tertiary-age granitic rocks. Simpson (1985) mapped a caldera near Rhodes Peak. Doughty (1991) described roof pendants in the Idaho batholith.

Regional economic geology and occurrence of mineral resources in and near the study area have been investigated. Lindgren (1903) described mineral deposits of the Bitterroot Range and Clearwater Mountains. Hill (1912) described the mining districts of the Western United States. Anderson (1930) described mineral resources near Orofino. Staley (1940) described mining activity along North Fork Clearwater River. Ross and Carr (1941) described the metal and coal mining districts of Idaho. Hubbard (1955) summarized mineral resources of Idaho. Sterrett (1958) described silica in the Pacific Northwest. Sahinen and Crowley (1959) summarized Montana mineral resources. Carter and others (1962) evaluated Pacific Northwest silica deposits. Sahinen (1962) described fluorspar deposits in Montana. Metz (1971), Lasmanis (1977), and Metz and others (1985) described the Snowbird mine. Mitchell and others (1980) collected information about geothermal investigations in Idaho. Mitchell and others (1981) compiled data about mines and prospects in the Hamilton Quadrangle. McKee and others (1982) evaluated uranium resources of the Hamilton Quadrangle. Zilka and Hamilton (1982) investigated minerals in the Selway-Bitterroot Wilderness. Finn and Kaplin (1986) investigated mineralization near Clarke Mountain. Zilka and others (1987) inventoried mineral resources in the Clearwater National Forest. Nevins and Oakman (1988) estimated mineral resource potential of national forest RARE II and wilderness areas in Idaho. Lowe and others (1992) described minerals in Idaho.

Present Study

USBM work was performed in three phases: prefield, field, and data interpretation and report preparation. Prefield work included research of geologic and mineral resource literature, mining claim records, and mine production data pertaining to the study area. Owners of patented and current or recently current claims were identified during searches of county and BLM (U.S. Bureau of Land Management) records and informed about the study. Shoshone, Clearwater, and Idaho County mining claim records were utilized (Zilka and others, 1987). District and regional offices of the Forest Service were contacted for geological data, road and trail reports, and other information pertinent to the study.

Fieldwork was conducted in 1990 and 1991. All known mines, prospects, and mineral sites in the study area were sampled and mapped, if warranted.

A portable scintillometer was used to measure radioactivity in the field. No radioactive resources were evaluated. However, thorium-bearing parisite, occurring in small amounts as a mineralogical curiosity at the Snowbird mine, is radioactive, as were traces of monazite sand in some alluvial-sample concentrates.

Besides the scintillometer, a VLF (very low frequency) electromagnetic receiver, a 10-gamma magnetometer, and a gamma-ray spectrometer were used at the Little Papoose claims.

Types of samples taken consisted of chip (fragments broken from a rock exposure in a continuous line or at approximately equal intervals), random chip (fragments broken unsystematically from the face of an apparently homogenous rock exposure), grab (fragments of loose material collected unsystematically from loose material or outcrops), channel (rock or loose material collected from a trough of measured width, depth, and

length), select (chipped or grabbed material of intentionally biased composition from a rock exposure or loose material), and pan (loose, alluvial accumulations, typically concentrated with a 14-in.- diameter gold pan). Latitude and longitude locations for all samples were determined using the 1927 North American datum.

Rock samples (232) and alluvial samples (272) were analyzed. Of these samples, six were taken by claimants or members of the IGS: IKM094 was supplied by claimant William Bolen; IKM233, IKM234, IKM240, and IKM504 were collected by IGS geologist Reed Lewis; and IKM258 was furnished by claimant William Cole. Rock samples were routinely analyzed for trace elements at a contract laboratory. Au (gold) was determined by fire-assay with AA (atomic absorption) finish. Hg (mercury) was determined by nitric- and sulfuric-acid digestion at 60 °C and AA analysis of hydride generation. Rock sample analyses for ten other elements were by aqua-regia leaching (extraction was partial). Subsequently, ICP (inductively coupled plasma emission spectroscopy) was used to determine Ba (barium), Mo (molybdenum), and W (tungsten). AA was used to determine Ag (silver), Cu (copper), Pb (lead), Zn (zinc), and Mn (manganese). Sb (antimony) and As (arsenic) were determined by flame AA. Arsenic levels below 40 ppm were determined by graphite furnace techniques. Analyses for gold, again by fire assay with AA finish, were verified for seven samples (IKM103, IKM201, IKM275, IKM276, IKM277, IKM282, IKM283) by a second laboratory.

Alluvial samples were mostly grabs of bank gravel or recent stream channel accumulations. Channel samples of alluvium were occasionally taken. Most alluvial samples were concentrated by screening through 1/4-inch screens and panning with 14-in.-diameter gold pans; screens and pans were composed of aluminum sheet metal. A small, aluminum, sluice box was used to preconcentrate one alluvial sample (IKM042P).

Alluvial samples were subsequently concentrated at WFOC (USBM Western Field Operations Center) on a laboratory-scale shaking table. A split of these concentrates was sent for analysis by the same methods used for rock samples, except that Ce (cerium) was additionally determined by aqua-regia leaching (partial extraction) and ICP methods. Chemical analysis of the alluvial concentrates measures a combination of loose placer gold and gold in minerals usually unrecoverable by placer methods. Concentrates typically contain 20 to 50 times more of the common heavy minerals than bank-run alluvium.

Another split of alluvial concentrates was examined microscopically; gold was recovered with tweezers and by amalgamation; nitric acid was used to remove iron oxide coatings prior to amalgamation. However, only two samples (IKM162P and IKM164P) contained dirty or oxidized gold. Most alluvial gold was in bright, small, angular to rounded flakes and grains. Amounts of magnetite were determined and the concentrates checked for radioactivity and fluorescence.

Whole-rock analyses for major rock-forming elements were performed on 19 samples. These samples were fused at 1,000°C in lithium tetraborate and lithium metaborate. Ca (calcium), Mg (magnesium), Mn (manganese), Fe (iron), P (phosphorus), and Ti (titanium) were determined by ICP and Al (aluminum), Na (sodium), K (potassium), and Si (silicon)

by AA. Concentrations were converted to the equivalent percentages of their respective oxides. LOI (loss on ignition) was determined by weight loss after calcining at 900°C.

Selected determinations were made by fusion and ICP for Th (thorium), Y (yttrium) and representative rare-earth elements La (lanthanum) and Ce (cerium). U (uranium) was analyzed by fusion and laser-induced fluorescent spectroscopy. F (fluorine) was analyzed by sodium hydroxide fusion and specific ion determination. Ti (titanium) and Fe (iron) were determined by ICP after digestion by, respectively, aqua regia and fusion. Be (beryllium) was determined by lithium borate fusion followed by AA and Sn (tin) by aqua-regia digestion followed by AA in a selected group of samples (IKM106-IKM129, IKM144, IKM146-IKM147, IKM149-IKM150, IKM201-IKM206, IKM210-IKM212, and IKM503); beryllium content was less than 1 ppm in all these, and tin content was less than 100 ppm. Another group of selected samples (IKM342, IKM345-IKM346, IKM404-IKM406, IKM408-IKM409, IKM415, IKM417, and IKM419) contained a maximum of 2 ppm beryllium, 35 ppm thorium, and 9 ppm uranium; none of these analyses of these selected samples are of economic interest.

Besides elements of direct economic interest, such as gold and silver, some of the elements determined during the analyses are so-called pathfinders. Pathfinder elements were defined by Levinson (1974, p. 53, 54) "as relatively mobile elements (or gases) occurring in close association with the element being sought, but which can be more easily found either because they form a broader halo, or because they can be detected more easily by present analytical methods." For example, arsenic, antimony, and mercury (Ashton, 1989) commonly occur with epithermal gold deposits. Anomalous amounts of pathfinder elements were used to delimit mineralized areas.

An anomalous elemental content is for this report, defined as one that is more than two standard deviations greater than the mean, using natural log transformations of analyses. Underlining is used in analytical tables (A-1, A-4) to designate anomalous samples and analyses. Samples anomalous in a single element are not considered as significant as those with several anomalous elements. Anomalies were calculated independently for rock samples and alluvial-sample concentrates. Most anomalous samples were from mineral sites, in part because the thresholds chosen are most appropriate for mineral resource studies and too high for studies of mineral potential.

For calculations of anomaly thresholds, half the detection level was used for samples with reported undetected elements, with one exception: approximately 0.000013 oz/yd^3 ($0.005/yd^3 with gold at $380/oz) was used for alluvial-sample concentrates reported to contain no visible gold. Two unique alluvial-sample concentrates (IKM018P, chunks of ilmenite; and IKM034P, picked sluice concentrates) were deleted from all statistical calculations. Likewise, gold and silver contents of four samples (IKM148P, IKM151P, IKM152P, and IKM153P) were deleted from statistical calculations because of suspected laboratory contamination by high-grade, concentrated alluvial samples, processed earlier.

The standard geochemical analytical package of this study can be characterized as oriented towards epithermal gold deposits. Therefore, anomalies selected from the analyses will be biased towards epithermal models.

Correction factors were calculated for alluvial gold values because of unavoidable biasing inherent in the sampling method: large pebbles, cobbles, and boulders were too big to pan and typically excluded from the pan samples, causing overestimation of amounts of placer gold. This high-graded, raw data would be most appropriate for gravel mined by small-scale suction dredging. Dilution factors of 0.3 to 0.7 were estimated; the average was about 0.6. Gold was assumed to be 850 fine (85 percent pure), a figure derived from average gold and silver content produced from alluvial gold in the Moose Creek, Clearwater/North Fork Clearwater region. Gold values/yd^3 for study area samples should be multiplied by these factors to obtain more representative values for gravel mined by large-scale dredging.

Expansion of 25 percent was assumed for alluvial samples. A gold price of $380/oz (estimated 1991 value; Lucas, 1991) was used for calculations of the gold value of gravel.

Concepts of mineral resource classification published by the U.S. Bureau of Mines and U.S. Geological Survey (1980) are used as guidelines in this report.

ACKNOWLEDGEMENTS

J. Douglas Causey and Richard L. Rains, both geologists at WFOC, assisted during fieldwork. Paul Erickson, technician at WFOC, analyzed placer samples. Eric Cather, geologist at WFOC, examined rock and alluvial-sample concentrates petrographically. Dr. Earl Bennett and Dr. Reed Lewis, geologists, IGS, contributed to the knowledge of the study area, supplied rock samples from mineralized sites, and provided logistical support. Particularly helpful mining claim holders included James Yount, William Bolen, William Cole, Kelly Cole, X. E. Durant, and Ronald Hartig. Harvey Grasser, back-country packer, provided guide service and historical information about the area. Stan Berry, another long-time resident, described old-time prospecting along Weitas Creek.

MINING HISTORY

Gold was discovered at Pierce, Idaho (fig. 1), in 1860. Three stages of mining for gold occurred. The first (from 1861 to 1892) was small-scale placer mining, the second (from about 1892 to about 1910) was lode mining, and the third (until the 1930's) was large-scale dredge mining (Space, 1979).

Prospectors, encouraged by the Pierce discovery, soon discovered placer gold near Moose City (pl. 1), on July 4, 1862. A gold rush started, and mining the new placers was successful for several years. After placer production declined in the 1870's, Moose City was abandoned. Starting in 1886, William Rhodes and his partners made discoveries at Blacklead Mountain (Space, 1979). Eugene Burton prospected south of Blacklead for more than 20 years starting around 1915 (Rodney Eugene Burton, claimant, 1992, written communication). Additional lode exploration was conducted at the property of the Clearwater Gold and Copper Company, starting about 1900, a few mi west of the north tip of the Hoodoo section of the Kelly-Cayuse study area (Causey, 1992, in preparation). During a period of increased activity in the 1930's, Independence Creek was dredged (Space, 1979). Staley (1940) reported prospecting and mining in the Kelly-Cayuse area near the head of Doe Creek, along Slide Creek, up Deadwood Creek, along Independence Creek, near the mouth of Laundry Creek, at the head of Moose Creek, near the mouth of Slate Creek, and along North Fork Clearwater River from Cedars Ranger Station to the mouth of Fix Creek. Prospecting and small-scale suction dredge mining have continued into the 1990's in the study area vicinity.

Mining Districts

Nine mining districts (fig. 3) in the vicinity of the study area are all precious metal (mainly gold) districts (Hill, 1912; Ross and Carr, 1941; Lawson, 1986). Boundaries are approximate.

The Moose Creek district, an area roughly 30 mi across, is centered around Moose, Independence, Osier (a shortened form of Hoosier), China, Deception, and Laundry Creeks; the core area is about 5 mi in diameter. Most of the Kelly Creek and Cayuse Creek drainages are in the Moose Creek mining district. The central Moose City area and the Moose Creek district are largely outside the study area.

Mining Claims

Approximately 1,100 mining claims have been located in or within about a mi of the study area. About 460 (380 lode, 80 placer) are current and nine others have been patented (Zilka and others, 1987; November 14, 1991, BLM recordations; David Wilson, claimant, 1992, oral communication; Mitchell and others, 1981). Many of the placer claims are gulch placers.

Some drainages in the study area have Idaho State Department of Water Resources stream-alteration-permit restrictions on suction-dredge placer mining: closed streams include Kelly Creek and its tributaries (except for Moose Creek) and North Fork Clearwater River upstream from Ruble Creek. The permit allowing suction dredging along Moose Creek

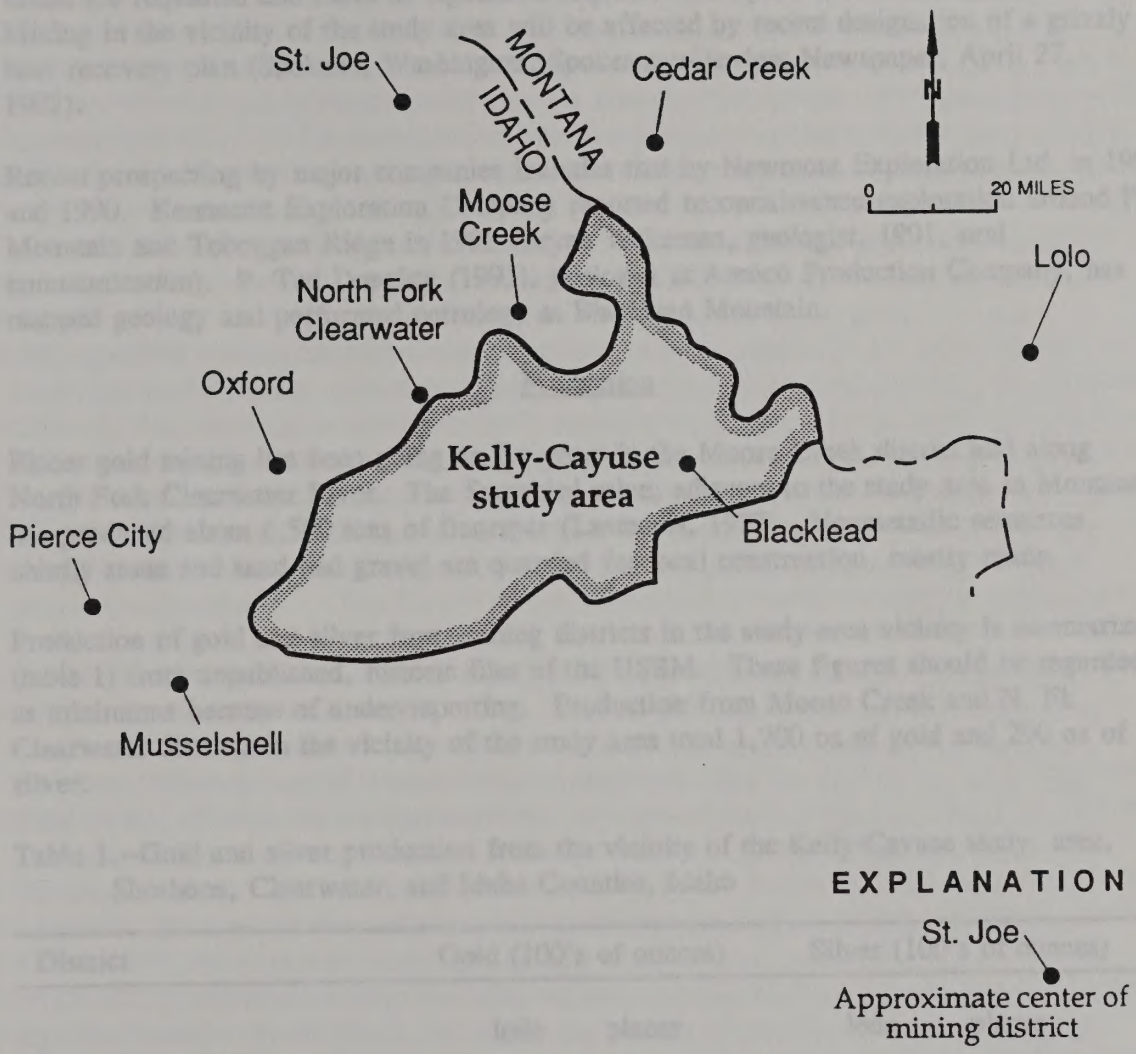


Figure 3.- Mining districts in the vicinity of the Kelly-Cayuse study area, Shoshone, Clearwater, and Idaho Counties, Idaho

Cedar Creek
St. Joe
Loon
Placer City
Missoula

and North Fork Clearwater River requires dredge intakes of less than 5 in. diameter, and suction dredging is permitted only during a summer season. The Lochsa River is closed to all dredging downstream from Powell Ranger Station, Idaho, by the Idaho Dredge Law, which also applies to suction dredges with intakes larger than 8 in. and additionally to ground disturbances of more than 0.5 acre (Idaho State, 1986). Withdrawals for Forest Service administrative sites and for damsites may affect other localities. The Forest Service is managing parts of the study area to preserve the wilderness character; Notices of Intent are requested and Plans of Operation required when pertinent to mining activities. Mining in the vicinity of the study area will be affected by recent designation of a grizzly bear recovery plan (Spokane, Washington, Spokesman-Review Newspaper, April 27, 1992).

Recent prospecting by major companies includes that by Newmont Exploration Ltd. in 1989 and 1990. Kennecott Exploration Company reported reconnaissance exploration around Pot Mountain and Toboggan Ridge in 1991 (Bryan Wakeman, geologist, 1991, oral communication). P. Ted Doughty (1991), geologist at Amoco Production Company, has mapped geology and performed petrology at Blacklead Mountain.

Production

Placer gold mining has been going on for years in the Moose Creek district and along North Fork Clearwater River. The Snowbird mine, adjacent to the study area in Montana, has produced about 6,500 tons of fluorspar (Lasmanis, 1977). Nonmetallic resources, chiefly stone and sand and gravel are quarried for local construction, mostly roads.

Production of gold and silver from mining districts in the study-area vicinity is summarized (table 1) from unpublished, historic files of the USBM. These figures should be regarded as minimums because of under-reporting. Production from Moose Creek and N. Fk. Clearwater districts in the vicinity of the study area total 1,700 oz of gold and 290 oz of silver.

Table 1.--Gold and silver production from the vicinity of the Kelly-Cayuse study area, Shoshone, Clearwater, and Idaho Counties, Idaho

District	Gold (100's of ounces)		Silver (100's of ounces)	
	lode	placer	lode	placer
N. Fk. Clearwater	None	4	None	0.9
Moose Creek	None	13	None	2.0
Pierce (including Oxford and Musselshell)	13	240	8	50.0
Total	13	257	8	52.9

MINERAL SETTING

The geology of the Kelly-Cayuse study area was most recently mapped (pl.2) by the IGS (Lewis, Burmester, Reynolds, and others, 1992; Lewis, Burmester, McFaddan, and others, 1992) concurrently with the USBM study. Other, earlier studies also included the region of the study area.

The Wallowa-Seven Devils terrane attached to older continental rocks southwest of Orofino and Lowell. A zone of subduction melting at depth generated mafic, intrusive igneous rocks between 120 and 80 million years ago and felsic, intrusive and extrusive igneous rocks from 80 to 65 million years ago. Extensive regional and local metamorphism of older, Belt- and pre-Belt-age rocks accompanied this igneous activity (Hyndman, 1989).

Granitic intrusions, such as those near the attachment zone, are occasionally associated with mineralized rocks. Likewise, related, fine-grained, igneous, intrusive and extrusive rocks, especially of Tertiary age, are associated with mineralization (Bennett, 1980; Johnson and Fifarek, 1991). In the Kelly-Cayuse vicinity, mineralization associated with igneous rocks includes gold, silver, copper, lead, zinc, mercury, antimony, manganese, tungsten, fluorine, titanium, and rare-earth elements. Tertiary-age granitic rocks typically contain elevated amounts of potassium, uranium, and thorium, as shown by aerial gamma-ray-spectrometer surveys (High Life Helicopters, Inc., and Geodata International, Inc., 1979), and beryllium, tantalum, hafnium, and zirconium, as shown by stream sediments (Goff, 1980). These intrusions locally contain pegmatites, quartzose veins, and miarolitic cavities (Bennett, 1980).

These igneous rocks in the study area (pl. 2) were loosely and collectively considered part of the Idaho batholith (Rember and Bennett, 1979). The batholith here is primarily diorite, granodiorite, tonalite, granite, and syenite. Three large, Tertiary-age intrusions in the study area vicinity are the Lolo Hot Springs batholith, the Bungalow pluton, and the Horseshoe Lake stock (Lewis, Burmester, McFaddan, and others, 1992; Lewis, Burmester, Reynolds, and others, 1992).

Tertiary-age volcanic rocks occur primarily in the eastern part of the study area, where they probably originated from the Lolo Hot Springs batholith (Hyndman, 1989). These rhyolitic volcanic rocks are associated with caldera or graben formation (Simpson, 1985; Doughty, 1991). This collapse feature was called the Rhodes Peak caldera by Simpson (1985), but is referred to as a graben (after Reed Lewis, geologist, IGS, 1992, oral communication) throughout this report. Other fine-grained dikes and small stocks crop out throughout the study area.

The Rhodes Peak graben area, which includes Blacklead Mountain and extends from the Snowbird mine to the Papoose Saddle area, is one of the most intensely mineralized parts of the study area. Collapse of overlying rocks during volcanic extrusion at the Rhodes Peak graben induced brecciation and high-angle tension fractures. These were ideal conduits for hydrothermal mineralizing fluids from cooling source rocks such as those near Rhodes Peak. High-angle, regional discontinuities related to graben formation are the

Shale Mountain fault and the Papoose Saddle fault. The Kelly Forks fault and the Hanson Ridge structure are other, major, high-angle structures. The major fault zones are typically more than a mi wide and composed of subparallel, branching segments. These faults, which probably had recurrent movement during the Mesozoic and Tertiary periods, are associated with Cretaceous-age tonalite, Eocene-age quartz syenite stocks, and Eocene-age volcanic rocks (Lewis, Burmester, McFaddan, and others, 1992). Geophysical anomalies, using gravity and magnetometer methods, corroborate the surficial indications of high-angle lithologic contacts (Dolores Kulik, geophysicist, USGS, 1992, oral communication).

Faults, both high and low angle, accompany mineralized rocks near Moose City, three or more mi from the nearest outcrops of igneous source rocks (Lewis, Burmester, McFaddan, and others, 1992). Earl Bennett, Idaho State Geologist, has postulated that thrust faulting and intense folding, associated with mountain building, carried gold-bearing rocks to the surface. Vigorous erosion then released the gold, which was deposited in the Tertiary-age gravel at Moose City. Later stages of erosion of this gravel developed additional placer gold deposits along the valleys (Earl Bennett, IGS, 1990, oral communication).

Mineralization occurred in reactive rocks. Examples of these rocks are intensely sheared, brecciated rocks associated with large-scale, low-angle faulting near Moose City. Sheared, brecciated schist along Deadwood Ridge contains gold, as do sheared, brecciated, silicified, sulfide-bearing granitic rocks south of Hanson Ridge. Gold occurs in brecciated quartzite along Moose Creek and in silica-, limonite-, and hematite-cemented quartzite and volcanic breccia northwest of Shale Mountain. Another example is the breccia of the Wallace Formation, in which calc-silicate rock near Papoose Saddle is mineralized by veins of stibnite and tetrahedrite. The breccia of the Wallace Formation represents a special case of reactivity, because it is both shattered and limy. Additionally, rare-earth elements occur in this breccia; the breccia and igneous rocks are both sources of rare earth anomalies in the study area.

The limy rocks are mostly Precambrian-age, pre-Belt- or Belt-correlative, but include some Paleozoic(?)-age rocks. Roof pendants of limy rocks occur locally. Tactites have formed. Paleozoic(?)-age marble at Blacklead Mountain occurs as roof pendants in the batholith (Lewis, Burmester, McFaddan, and others, 1992); small, massive, pyrite, chalcopyrite, and magnetite lenses occur here. Lenses of magnetite occur both in marble and granitic rocks.

Nonmetallic resources occur. Quartzite has been considered for some silica uses. Stone and sand and gravel are mined locally for road construction and maintenance, mainly outside the study area and particularly along Lochsa River and North Fork Clearwater River.

APPRAISAL OF SITES EXAMINED

Lode (rock) and placer localities are described in separate sections, although alluvial-sample-concentrate anomalies are used during discussions of lodes, and lodes influence alluvium derived from them. Mineral resources were found for one lode (Driessel prospect) and two placer localities (Moose Creek and North Fork Clearwater River). Although no economic resources were delineated, anomalous sample composition and favorable geologic environments warrant prospecting for disseminated and vein gold deposits.

Lode Mineral Localities

Principal lode mineral localities are discussed in the text by geologic region, in alphabetical order. Miscellaneous lode sites are summarized in table 2 and shown on pls. 1 and 2. Sample description tables contain additional, pertinent information about all sites. Lode localities are clustered near Moose City, at the Snowbird mine, at Blacklead Mountain, and at Papoose Saddle. Vein and disseminated mineralized areas occur.

Hanson Ridge Structure

The Hanson Ridge structure, in the east part of the study area (pl. 2; Lewis, Burmester, McFaddan and others, 1992) is an important, faulted, east-trending zone several mi wide associated with syenite, tonalite, granite, granodiorite, schist, gneiss, and porphyritic fine-grained intrusions. Several lode and many placer mining claims have been located in the vicinity (see Zilka and others, 1987).

The most important prospect examined along Hanson Ridge is the Driessel prospect, where subeconomic mineral resources were delineated.

Driessel Prospect

The historic claims covering the Driessel prospect are at 4,200 ft elevation in sec. 24, T. 39 N., R. 12 E. on Hanson Ridge, approximately a half mi north of the mouth of Deer Creek, a tributary of Kelly Creek (pl. 1).

B. W. Driessel located a group of lode and placer claims here in 1937 and 1938. The claims were investigated by the U.S. Bureau of Mines in 1950 as part of the DMEA (Defense Minerals Exploration Administration) program, but no samples were taken. There were no current claims at the time of this study. The workings are small, caved pits and trenches (fig. 4).

Brecciated, sheared, silicified, limonitic, argillic, sericitic granitic rock in a lenticular zone strikes N. 50° W. and dips about 40° SW. The prospect, on the Hanson Ridge structure, is associated with nearby tonalite and syenite (Lewis, Burmester, McFaddan, and others, 1992). Porphyritic andesite also occurs nearby. Several generations of quartz, fine to coarse grained, indicate multiple stages of mineralization. Chalcedonic silica is associated with fine-grained pyrite and arsenopyrite.

Ten rock samples were taken from the mineralized lens and two from surrounding rock. The ten samples from the mineralized lens were mostly anomalous in gold, arsenic, and mercury, with additional molybdenum, antimony, and silver anomalies.

Five chip samples from the mineralized lens all contained significant gold, from 940 to 5,665 ppb. Simple average was about 3,300 ppb and length-weighted average was about 2,730 ppb, or approximately 0.1 oz/ton of gold.

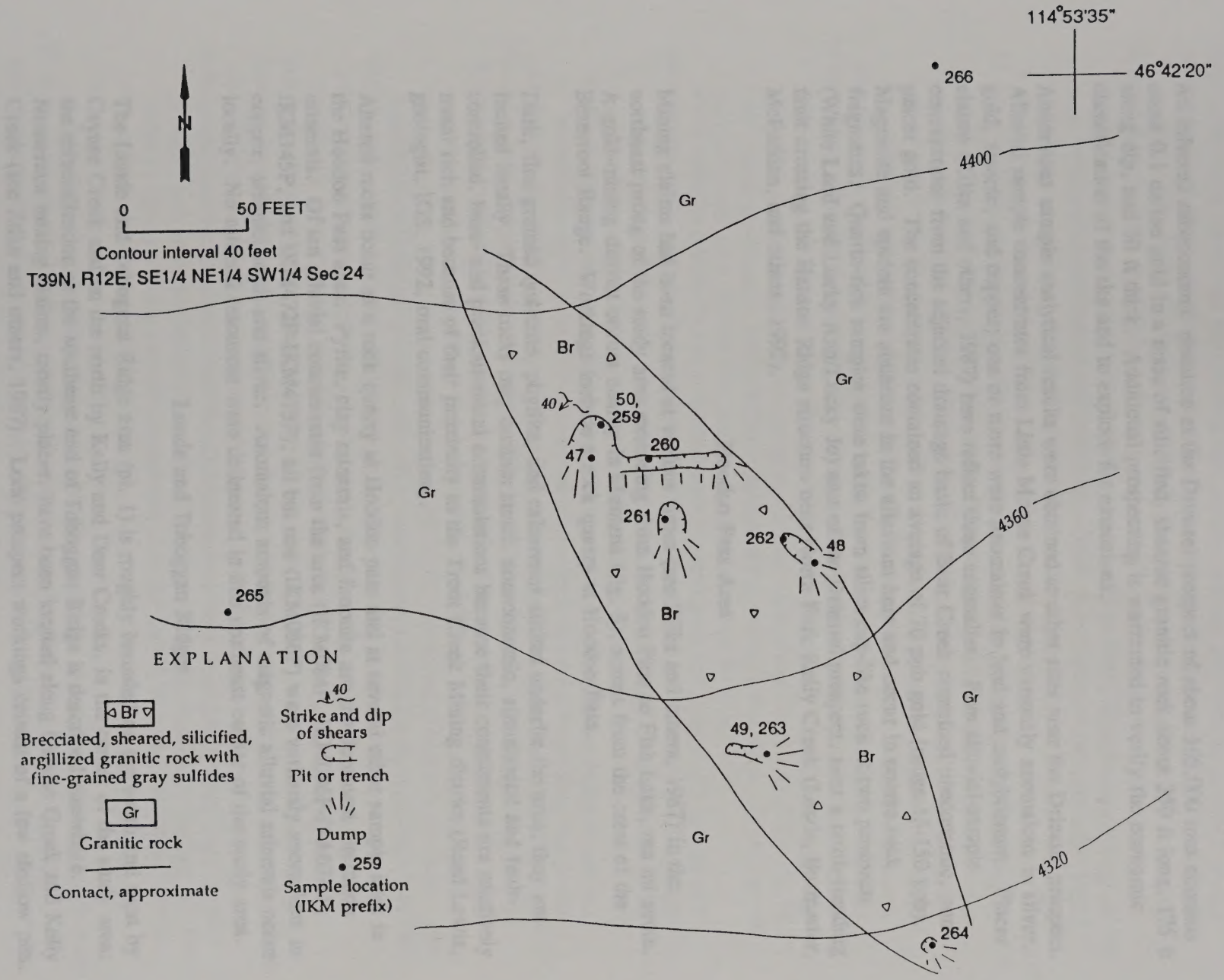
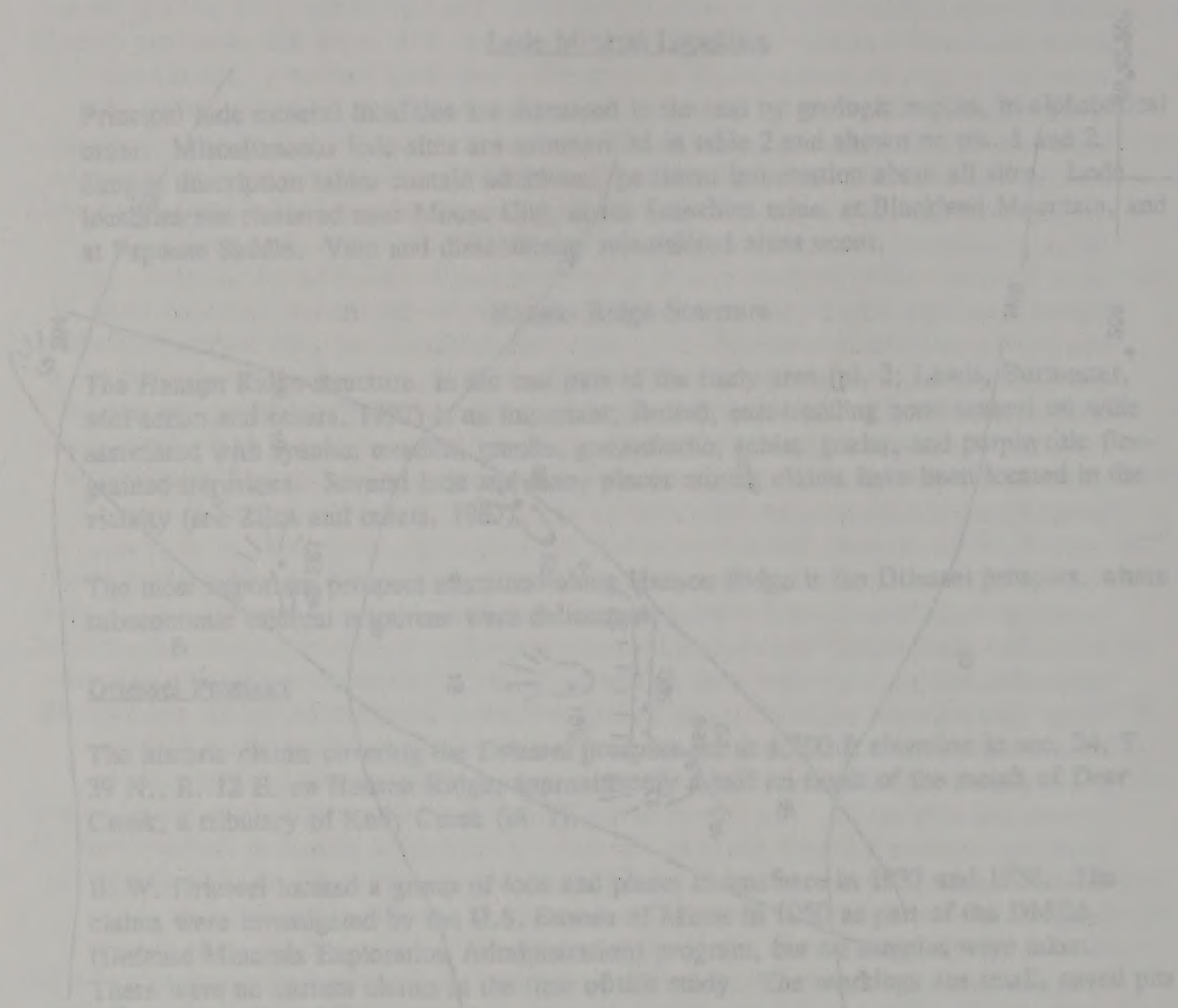


Figure 4.- Sample localities and geology at Driessel prospect, Kelly-Cayuse study area, Clearwater County, Idaho



An inferred subeconomic resource at the Driessel prospect of about 165,000 tons contains about 0.1 oz/ton gold in a mass of silicified, sheared granitic rock about 350 ft long, 175 ft along dip, and 30 ft thick. Additional prospecting is warranted to verify the economic classification of the site and to explore for extensions.

Anomalous sample analytical results were obtained at other sites near the Driessel prospect. Alluvial sample concentrates from Little Moose Creek were variously anomalous in silver, gold, arsenic, and copper; one or more were anomalous in lead and molybdenum. Placer claims (Zilka and others, 1987) here reflect these anomalies. Five alluvial-sample concentrates from the adjacent drainage basin of Bear Creek contained uneconomic, non-placer gold. The concentrates contained an average of 70 ppb gold (range 15-150 ppb). Magnetite and epidote are abundant in the alluvium here and occur in coarse rock fragments. Quartz-rich samples were taken from silica-cap-like rock at two prospects (White Lead and Lucky Ann/Lucky Jo) east of the Driessel prospect, near a north-trending fault crossing the Hanson Ridge structure near North Fork Kelly Creek (Lewis, Burmester, McFaddan, and others, 1992).

Hoodoo Pass Area

Mining claims had been located at various times (see Zilka and others, 1987) in the northeast prong of the study area extending from Hoodoo Pass to Fish Lake, ten mi south. A gold-mining district occurs nearby in Montana (fig. 3), across from the crest of the Bitterroot Range. Workings include a rock quarry at Hoodoo Pass.

Dark, fine-grained quartzite, phyllite, and calcareous siltites underlie the area; they are faulted locally. These rocks may contain small, noneconomic, stratabound and fault-controlled, base- and precious-metal accumulations because their constituents are relatively metal rich and because of their proximity to the Trout Creek Mining district (Reed Lewis, geologist, IGS, 1992, oral communication).

Altered rocks occur at a rock quarry at Hoodoo pass and at several other sample sites in the Hoodoo Pass area. Pyrite, clay minerals, and limonite are the dominant alteration minerals. Of ten alluvial concentrates from the area (IKM084P, IKM086P-IKM091P, IKM145P, and IKM472P-IKM473P), all but one (IKM086P) were variously anomalous in copper, arsenic, lead, and silver. Anomalous amounts of magnetic alluvial minerals occur locally. No mineral resources were delineated in this northeast corner of the study area.

Lunde and Toboggan Ridges

The Lunde and Toboggan Ridge area (pl. 1) is roughly bounded on the south and west by Cayuse Creek and on the north by Kelly and Deer Creeks, in the center of the study area; the mineralization at the southeast end of Toboggan Ridge is described elsewhere. Numerous mining claims, mostly placer, have been located along Cayuse Creek and Kelly Creek (see Zilka and others, 1987). Lode prospect workings consist of a few shallow pits.

Lunde Ridge is underlain by granite, syenite, and granodiorite intrusions; schist and gneiss; and minor quartz and simple pegmatite veins. Granitic rocks here contain more magnetite than other granitic rocks in the study area (Reed Lewis, geologist, IGS, 1992, oral communication). The Kelly Forks fault and its extensions form one boundary, the Hanson Ridge structure another, and the Shale Mountain fault the third. Intersections of these high-angle structural zones are especially significant; these structures have played a significant part in mineralizing Lunde and Toboggan Ridges.

Near Lunde Ridge, Toboggan Creek, and Cayuse Creek, a rock sample (IKM297) and 13 alluvial sample concentrates (IKM043P, IKM284P, IKM285P, IKM286P, IKM287P, IKM292P, IKM294P, IKM313P, IKM315P, IKM321P, IKM323P, IKM333P, and IKM476P) were anomalous, particularly in mercury and tungsten; one or more were anomalous in gold, molybdenum, arsenic, manganese, zinc, copper, and antimony. In addition, anomalous concentrations of magnetic minerals occur in alluvium along Cayuse Creek in the vicinity of Lunde Ridge. No mineral resources were delineated in this part of the study area.

Moose City Vicinity

The Moose City area is the most densely prospected and mined locality adjacent to the study area. It was the site of the earliest gold discoveries in the region. The old townsite of Moose City is about one mi north of the study area (pl. 1).

Granite, foliated granitic rock, quartzite, schist, gneiss, quartz veins, pegmatites, mafic dikes, and gold-bearing gravels crop out in the vicinity. Faulting, which influenced mineralization, includes the Kelly Forks fault (Lewis, Burmester, McFaddan, and others, 1992) and regional low-angle faults. Alteration minerals include limonite, clays, mica, and silica. Brecciation, alteration, and weathering have caused the rocks to become friable at the surface.

Ten rock samples and alluvial concentrates (IKM015, IKM026P, IKM030-IKM032, IKM093P, IKM098P, IKM195P, IKM237P, and IKM238P) from the Moose City vicinity were anomalous in barium and gold. One or more are anomalous in manganese, silver, and mercury. Along lower Kelly Creek and along a section of North Fork Clearwater River above Kelly Forks, rock and alluvial-concentrate samples contained anomalous gold and silver, and one or more contained anomalies in copper, cerium, barium, and mercury. None of the samples from the vicinity of Moose Mountain, Bear Gulch, Schmidt Gulch, Clayton Gulch, and Craig Creek were anomalous. Except for placers along Moose Creek, no mineral resources were delineated in this region of the study area.

Lost Cabin Claims

The Lost Cabin claims are at about 4,500 ft elevation along Deadwood Creek and Deadwood Ridge, in T. 40 N., R. 10 E., secs. 25 and 30 and T. 40 N., R. 11 E., sec. 30 (pl. 1). They were located from 1978 to 1989 by Joel J. Job and James E. Martin. The Lost Cabin claims include one hydraulicked placer claim across Deadwood Creek from the mouth of Schmidt Gulch.

Schist and gneiss occurring here have been intensely faulted and sheared. The rocks are argillized and silicified, with intersecting, high-angle quartz veins and simple pegmatites.

Of the nine lode samples (IKM012-IKM016 and IKM020-IKM023) from the vicinity of the Lost Cabin claims, all but two (IKM012 and IKM014) contained detectable gold, as much as 535 ppb, an anomalous but not economic amount. Most of the samples were from thin quartz veins and sheared schist and gneiss; the sample containing 535 ppb gold was from a wide zone of sheared biotite schist accompanied by quartz and pegmatite stringers. No mineral resources were delineated; however, the analyses indicate anomalous mineralization.

Pot Mountain Contact Zones

The Pot Mountain contact zone, in the west central part of the study area (pl. 1), extends about 3 mi south of North Fork Clearwater River. Mining claims, mainly placer, have been located almost continuously along North Fork Clearwater River (see Zilka and others, 1987; also, see Causey, 1992, in preparation) and up tributary drainages. Workings are shallow placer pits, borrow pits, sand and gravel pits, and dozer scrapes.

The Tertiary-age Bungalow pluton is geochemically anomalous (Reynolds, 1991). Tonalite, schist, gneiss, granodiorite, quartz and pegmatite veins, mafic dikes, and faults, comprise a complex zone associated with the border of the intrusion. These and upriver sources of alluvium contributed to anomalous samples.

Concentrates of ten alluvial samples taken south of Pot Mountain outcrops of the Bungalow pluton (IKM143P, IKM157P, IKM158P, IKM159P, IKM191P, IKM192P, IKM451P, IKM454P, IKM500P, IKM501P) mostly contained anomalous tungsten, barium, cerium, mercury, and gold with one or more anomalies in silver and arsenic. Nearby, south of Fawn Creek, a sample from Weitas Creek (IKM362) contained anomalous antimony. No lode mineral resources are apparent. Mineralization in the Pot Mountain area is described by Causey (1992, in preparation).

Rhodes Peak Graben

The Rhodes Peak graben, in the southeast part of the study area, lies southeast of the Shale Mountain fault and northwest of the Papoose Saddle fault (pl. 2). The graben, encompassing the Blacklead mining district, is associated with porphyritic and brecciated volcanic and fine-grained intrusive rocks, including a volcanic neck(?) in the Crooked Fork vicinity. The graben is part of a permissive tract for Comstock-type epithermal deposits described by Johnson and Worl (1991).

Groups of mining claims have been located in the vicinity of the Rhodes Peak graben in the past, but modern prospecting methods have not been widely used here (Stotelmeyer and others, 1991). Although no mineral resources were found, additional exploration for vein and disseminated gold deposits is warranted.

Blacklead Mountain Prospects

A concentration of historic and current claims lies near the summit of Blacklead Mountain (elevation 7,318 ft), in T. 38 N., R. 13 E. (pl. 1). William Rhodes and partners discovered silver near Blacklead Mountain in 1886. Lafayette Williams also prospected in the Blacklead vicinity about this time. Later, Ernest Hansen investigated the Blacklead area from about 1902 until 1914. Walter Sewell and John Austin followed. In 1914, Charles M. Allen examined the Blacklead prospects (Space, 1979). In 1935, the Maloneys located claims here. In 1948, Edward F. Brown and others located the Black Magnet claim. Herb Olson located the Scenic View claims in 1960. Joel Wilson and partners located the Black Lead Group in 1967 and 1968 and the Wilson No. 1 claim in 1968. The area is not currently claimed.

Mineral localities at Blacklead Mountain (fig. 5) were investigated for copper and iron, on a small scale (Anderson, 1930, p. 13, 42). Early claimants excavated short adits (now caved), shafts, and small pits and trenches. The longest open underground working measures about 40 ft long.

Granitic rocks, marble, and porphyritic volcanic rocks are exposed. Limonite, tactite, pyrite, and magnetite occur in sheared lenses; although disseminated pyrite occurs in fine-grained intrusive breccia. Lenses of gray, medium- to coarse-grained, dolomitic marble (see analysis for IKM177, appendix table A-5), are intercalated in the igneous rocks (fig. 6) and are locally at least 200 ft thick. Some of the magnetite lenses are 3 ft thick and at least 100 ft long. Copper carbonate has stained some outcrops. Sparse talc and serpentinite occur locally in sheared marble. Johnson and Meinert (1991) in Montana and Vallone Logan and others (1991) in Argentina have recently described mineralization in environments similar to those of Blacklead Mountain.

Brecciation related to volcanism, graben formation, and the Shale Mountain fault (Lewis, Burmester, McFaddan, and others, 1992) prepared rock for mineralization; these and other faults conducted mineralizing fluids to the localities.

Eleven samples (IKM172-IKM176, IKM178-IKM179, IKM219-IKM221, and IKM380) taken from the area mostly contained anomalous copper or manganese, and one or more contained variously anomalous molybdenum, barium, silver, and arsenic. Samples from near the summit of Blacklead Mountain contained maximums of 51.3 percent iron, 295 ppb gold, 37 ppm silver, 1.1 percent copper, 1.5 percent arsenic, and 4 percent manganese. A chip sample across 18 ft of sheared, brecciated, volcanic rock contained 172 ppb gold; though not economic, this amount of gold in such a wide occurrence is significant. Exposed, high-grade lenses are too small to mine for any of the contained metals. No mineral resources were delineated in the Blacklead Mountain area. Other specific prospects are discussed below.

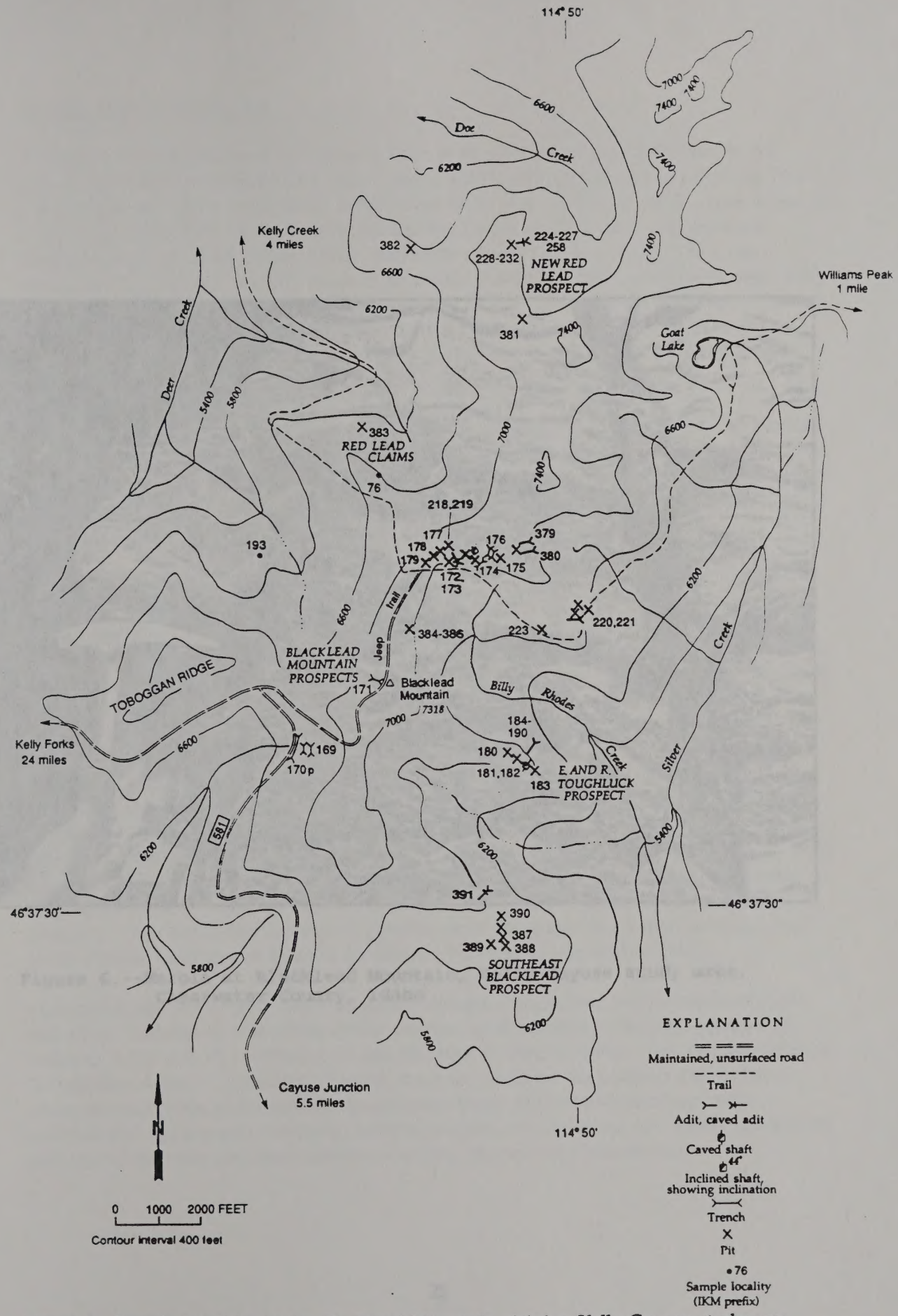
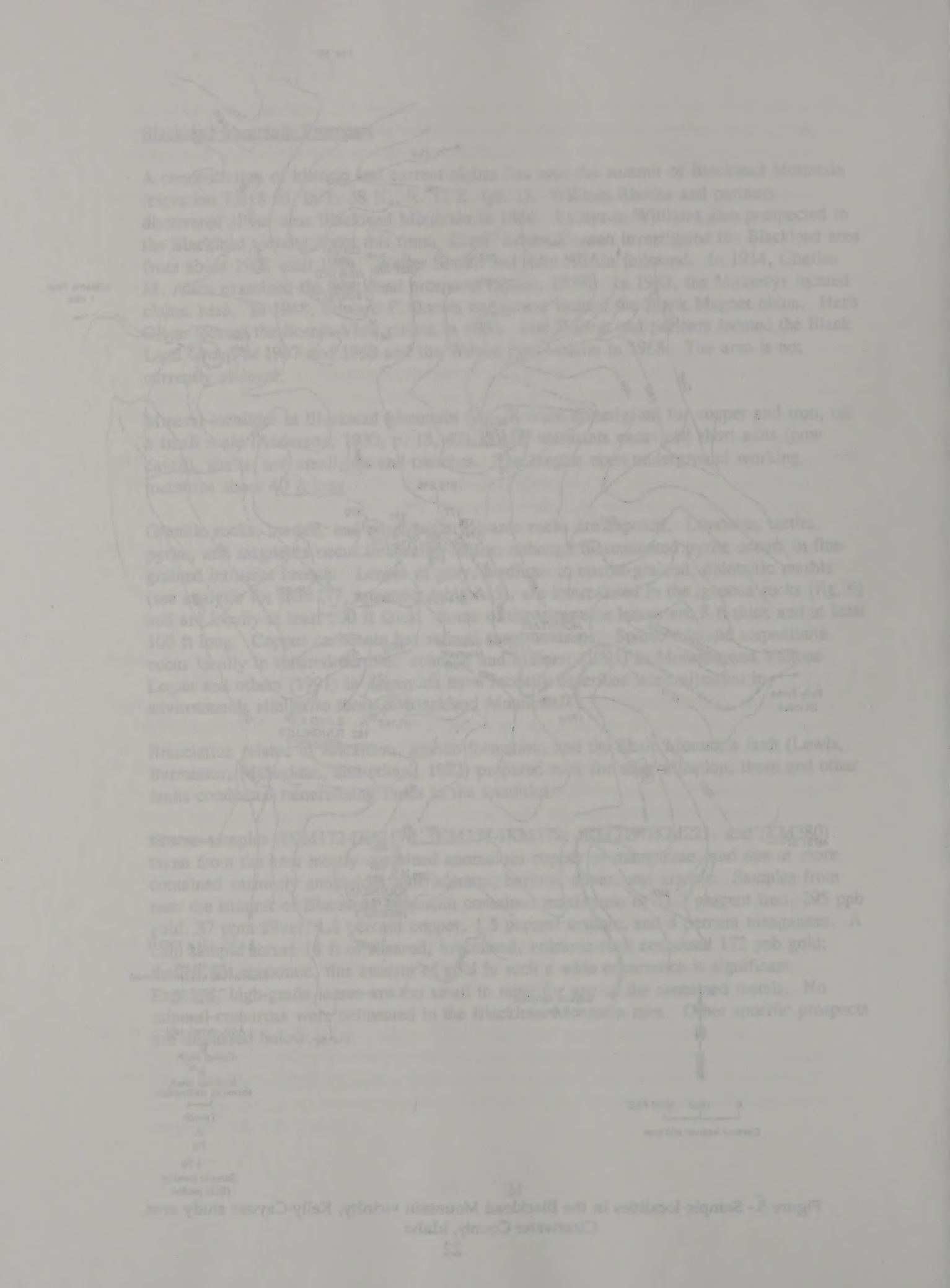


Figure 5.- Sample localities in the Blacklead Mountain vicinity, Kelly-Cayuse study area, Clearwater County, Idaho



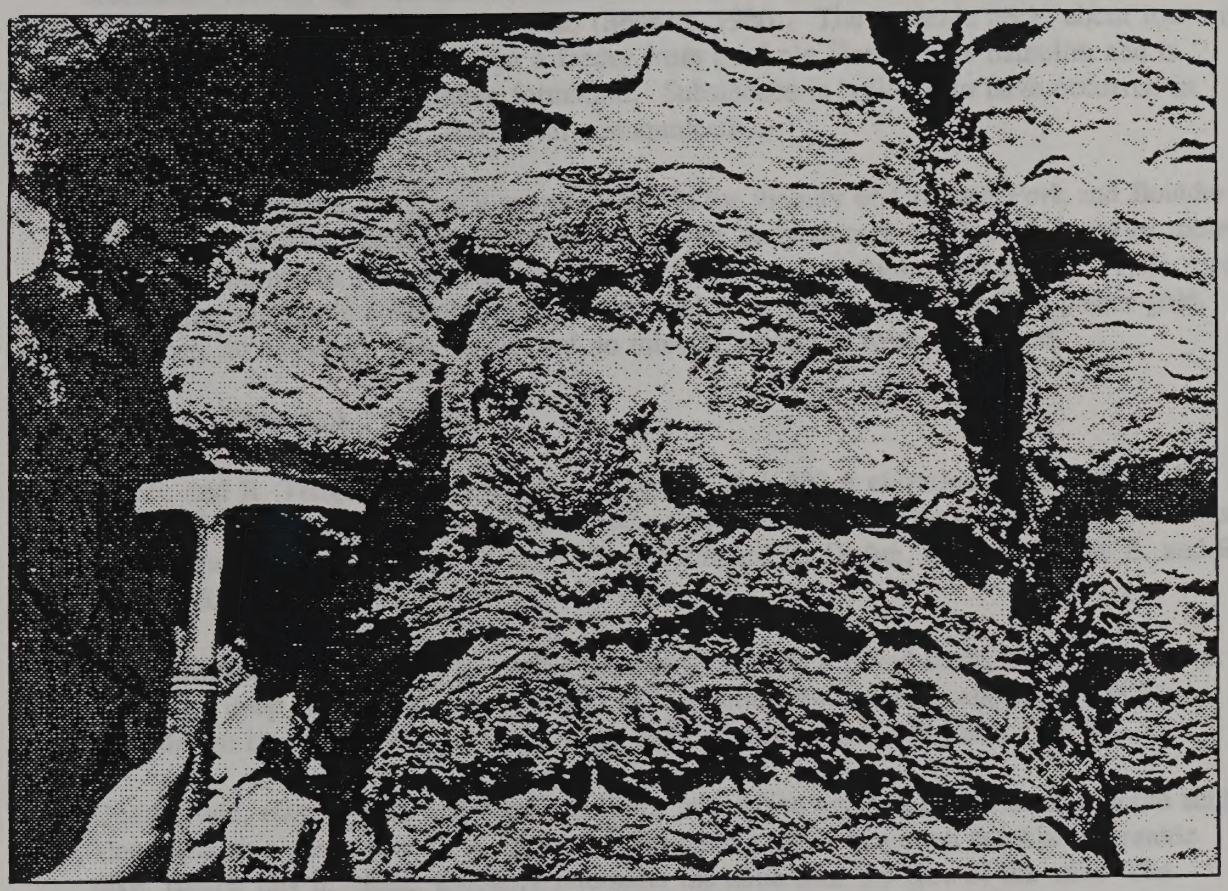


Figure 6.--Marble at Blacklead Mountain, Kelly-Cayuse study area, Clearwater County, Idaho

Crooked Fork Volcanic Plug

A volcanic breccia occurs along Crooked Fork in the vicinity of Hopeful Creek at the extreme east end of the study area (pl. 1; Nold, 1968). Historic claims included the Fetch 1-3 lode claims, which are at about 5,000 ft elevation in T. 38 N., R. 14 E., secs. 8 and 9, a site west of BM Hill. J. L. Waylett located the claims in 1963; they are abandoned. Geologic mapping (Nold, 1968; Lewis, Burmester, Reynolds, and others, 1992) shows brecciated Tertiary-age volcanic rocks in an eroded volcanic neck(?), a lithology associated with gold deposition elsewhere in Idaho (Bennett, 1980). The volcanic neck, about four mi across, is conjectured to have been a feeder from the Lolo Hot Springs batholith and is associated with caldera or graben formation. Subsidence is believed to have occurred in the plug (Reed Lewis, IGS, 1992, oral communication).

Alluvial concentrates and a rock sample taken in the vicinity of Crooked Fork and Boulder and Hopeful Creeks contained variously anomalous molybdenum and lead and one or more contained anomalous mercury, antimony, zinc, manganese, barium, and cerium. Also, two of the alluvial-sample concentrates from Crooked Fork contained minor, non-placer gold. However, no workings were found and no mineral resources were delineated.

E. and R. Toughluck Prospect

The E. and R. Toughluck prospect (pl. 1, fig. 5), at 6,400 ft elevation in sec. 16, T. 39 N., R. 13 E. is southeast of Blacklead Mountain about a mile. The prospect was examined in the company of Ronald D. Hartig. He and Edward C. Ogden, Jr., located the E. and R. Toughluck claim in 1984.

Old workings, probably dug by earlier claimants, include a caved shaft, estimated to be at least 50 ft deep, and small trenches and pits. Additionally, a trench and short adit have been driven by the current claimants along narrow shear zones and joints (fig. 7).

Quartz, talc, clay, pyrite, and copper sulfides mineralize veins in quartzite and biotite schist along limonitic shear zones. A narrow, cross-cutting shear zone and associated granitic dike, each a few in. thick, probably intersects the zone near the face of the adit. The prospect is near the faulted contact of granitic rocks and quartzitic metasedimentary rocks in the Rhodes Peak graben (Lewis, Burmester, McFaddan, and others, 1992).

Eleven samples were taken; seven contained variously anomalous molybdenum, copper, and silver, and one or more contained anomalous gold and lead. Samples contained as much as 3,725 ppb (0.1 oz/ton) gold and 260 ppm (8 oz/ton) silver. One sample contained 5.0 percent copper. Thoroughly altered, fractured rocks on the prospect are similar to those accompanying disseminated deposits elsewhere. No mineral resources were delineated at the prospect; however, sample analyses are anomalous and justify prospecting for high-grade veins and disseminations carrying precious and base metals.

Figure 7.--Adit on E. and R. Toughluck prospect, Kelly-Cayuse study area, Clearwater County, Idaho

Little Papoose Claims

The Little Papoose claims are located at about 5,000 ft elevation in T. 38 N., R. 13 E., sec. 12 and in T. 38 N., R. 14 E., secs. 5-7. The property is located in the Papoose Creek drainage outside the study area boundary about 4 mi north of Powell, Idaho (pl. 1). These current claims were located between 1967 and 1969 by Lois W. Larson.

Workings in the vicinity consist of a 48-ft-long adit, a caved adit with about 500 ft of workings, numerous dozer roads and scrapings, and small trenches and pits. The site has been drilled and investigated using VLF electromagnetic, gamma-ray spectrometer, and magnetometer techniques, but none of this information and no production data have been released by the claimant.

Granitic and volcanic rocks, mafic dikes, the breccia of the Wallace Formation, quartz veins, and the Papoose Saddle fault crop out in the vicinity (Lewis, Burmester, McFaddan, and others, 1992; Lewis, Burmester, Reynolds, and others, 1992). The fault, striking southwest out of the Crooked Fork volcanic plug and Lolo Hot Springs batholith, conducted mineralizing solutions into the Little Papoose claim area. Quartzose veins, some of which are more than one ft thick, contain massive, cockscombed stibnite and blebs of tetrahedrite, both minerals of antimony. An intersection of veins has localized the most intensely mineralized rock; at the portal of the open adit, one set of veins strikes N. 10° E. and dips 10° NW., and another strikes N. 25° W. and dips 65° SW. Disseminated mineralization also occurred in the intensely shattered, calc-silicate breccia of the Wallace Formation. Exposures of mineralized rock are obscured by slopewash and vegetation.

Thirteen anomalous samples taken in the vicinity contained variously anomalous antimony, silver, mercury, gold, and copper. Samples contained as much as 1,405 ppb (0.04 oz/ton) gold, 580 ppm (16.9 oz/ton) silver, 902 ppm copper, 168 ppm lead, 345 ppm zinc, 365 ppm arsenic, 3.8 percent antimony, and 12,750 ppb mercury.

The White Rock group of historical claims, site of an anomalous sample containing 1,265 ppb mercury, is adjacent north of the Little Papoose claims and is centered around massive quartz veins.

New Red Lead Prospect

The New Red Lead workings are at about 7,000 ft elevation in sec. 4, T. 39 N., R. 13 E., 2.5 mi north of Blacklead Mountain at the head of Doe Creek in the basin of upper Kelly Creek (pl. 1, fig. 5). Walter Sewell and his partners located the Red Lead claim in 1935. The Cole family located the Red Lead and New Red Lead claims in 1983.

The claims were examined in the presence of claimants William and Kelly Cole, who were opening an old adit with picks, shovels, a wheelbarrow, a portable conveyor belt system, and a small dragline-type slusher. Plans for dozer work were being made by the claimants (Pam Stotts, geologist, U.S. Forest Service, 1992, oral communication). Estimated length of the underground workings is about 100 ft.

Mineralization was along a sheared, brecciated zone which trends N. 70° E. with steep dip. The altered zone is at least 50 ft wide and extends horizontally about 500 ft from a narrow saddle on the ridgecrest to the caved adit, approximately 200 ft vertically below. The zone is subparallel to boundary faults of the Rhodes Peak graben; the faults extend from the Lolo Hot Springs batholith (Lewis, Burmester, McFaddan, and others, 1992).

Porphyritic dacite or andesite dikes crop out around the portal, although granitic rocks occur nearby. The porphyritic volcanic rocks are sheared, argillized, limonitic, calcitic, and locally silicified. Some of the volcanic rocks are brecciated. All are blue-green, containing chlorite and small amounts of epidote. Primary metallic minerals were not found; volcanic rocks locally have boxwork structures typical of weathered-out pyrite and arsenopyrite.

Of nine samples from the New Red Lead prospect, five contained variously anomalous lead, zinc, and tungsten; a molybdenum anomaly also occurred. Samples from the prospect contained maximums of 43 ppb gold, 4.9 ppm silver, 121 ppm copper, 1,005 ppm lead, 2,250 ppm zinc, 17 ppm arsenic, 42 ppm tungsten, 2,450 ppm manganese, 42 ppm molybdenum, and 125 ppb mercury. Size of the sheared structure indicates a significant volume of mineralized rock, but no mineral resources were delineated. Sample analyses are anomalous, and the property warrants continued prospecting.

Shale Mountain Gold Occurrence

The Shale Mountain gold occurrence (fig. 8) is at 6,600 ft elevation in sec. 15, T. 39 N., R. 13 E., one mi northwest of Shale Mountain. This locality was recognized by Earl Bennett, Idaho State Geologist, during the concurrent study performed by the IGS. The 368 SM mining claims were located by David Wilson in the vicinity of Shale Mountain subsequent to publication of preliminary information from this report (Stotelmeyer and others, 1991).

The locality is in the Rhodes Peak graben of Lewis (Reed Lewis, geologist, IGS, 1992, oral communication) near the contact of porphyritic, Tertiary-age volcanic rocks and underlying quartzite of the Mount Shields Formation (pl. 2). Coarse-grained, Tertiary-age intrusive rocks nearby include the Lolo Hot Springs batholith and the Horseshoe Lake stock. Igneous rocks like these are associated with mineralization elsewhere in Idaho (Bennett, 1980; Johnson and Fifarek, 1991). High-angle, cross-cutting faults extend between the Tertiary plutons (Lewis, Burmester, McFaddan, and others, 1992; see Sillitoe and Bonham, Jr., 1990). Low-angle faulting has occurred, particularly along the contact between the metasedimentary and volcanic rocks.

Gold-bearing, coarse, quartzite breccia contains red to gray, angular to rounded, quartzite fragments in an estimated 40 percent, fine-grained, argillic, limonitic, hematitic, silica-rich matrix. Quartzite breccia zones (fig. 9) near the low-angle fault are tens of feet thick, hundreds of feet wide, and occur in intermittent outcrops along more than a mile of ridgecrest. Some breccia fragments were partially replaced by the matrix. Some, showing little rotation, are oriented subparallel to the underlying quartzite. The most intensely

Figure 8.--Ridge northwest of Shale Mountain, Kelly-Cayuse study area, Clearwater County, Idaho

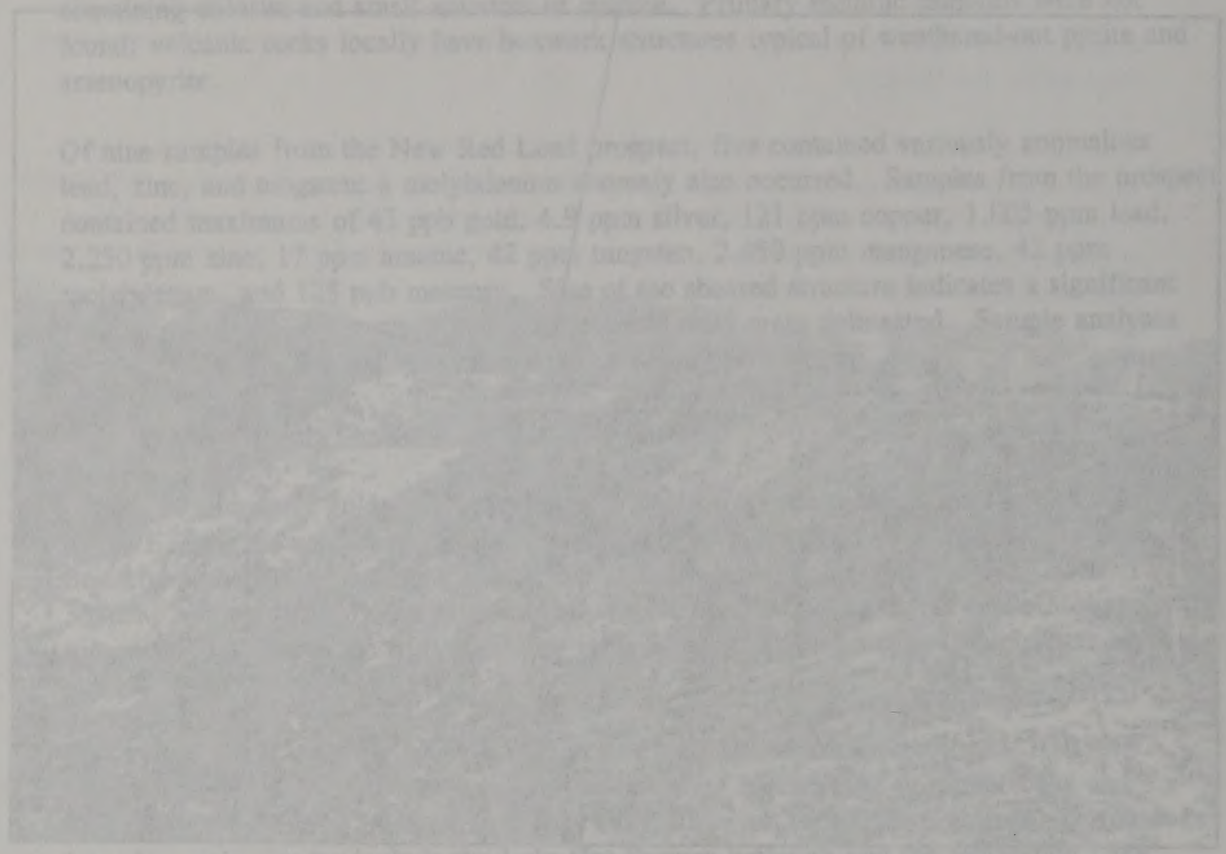


Figure 9.--Quartzite breccia on Shale Mountain, Kelly-Cayuse study area, Clearwater County, Idaho

mineralized breccia is associated with high-angle, cross-cutting faults near the low-angle, faulted contact with overlying volcanic rocks. Copper carbonate has stained intensely mineralized rock; unidentified primary ore minerals are fine-grained and dark gray. Subhedral, stubby, blue to violet grains of tourmaline occur in trace amounts (see Payne, 1992, for a discussion of boron in mineralized rock).

From the Shale Mountain gold occurrence vicinity (pl. 1, fig. 10), four samples, contained variously anomalous gold, lead, and manganese. Average of three gold analyses of IKM103 (272, 750, and 785 ppb) was 602 ppb, or about 0.02 oz/ton gold. Average gold content of six random-chip samples within the breccia zone over a width of about 150 ft was about 230 ppb (0.007 oz/ton). Mineralization extends a short distance into unbrecciated quartzite, as shown by sample IKM275. Multiple analyses of these gold-bearing samples showed little variation, indicating finely dispersed gold or gold combined in other minerals. Arsenic and antimony, typical gold pathfinder elements, are present, but in small amounts (respective maximum contents of 15 and 35 ppm). Maximum mercury content was 135 ppb.

Low grade and small size of the occurrence preclude estimation of resources. Although the amounts of gold are not economic, they warrant continued prospecting, especially considering the widespread extent of favorable geology in the Shale Mountain area.

Southeast Blacklead Mountain Prospect

This prospect is about a mi southeast of Blacklead Mountain at an elevation of 6,400 ft in T. 38 N., R. 13 E., approximately in unsurveyed secs. 20 and 21. Its history probably traces to mining claim locations noted from the early days of exploration at Blacklead Mountain.

Marble crops out along the sheared contact zone between granitic rocks and limonitic, laminar to coarse-bedded quartzite (figs. 5 and 11). Small, caved workings lie along the contact; their distribution indicates that the mineralized zone extends at least 1,400 ft. Tactites in marble contain magnetite, pyrite, chalcopyrite(?), garnet, diopside, and epidote. The tactites are lenticular and 10 to 20 ft thick; one crops out intermittently for about 500 ft. The tactites occur along a major fault, part of the Rhodes Peak graben (Lewis, Burmester, McFaddan, and others, 1992), trending northwest and dipping 50° SW.

Four anomalous rock samples from the prospect and an anomalous pan sample concentrate (IKM164P) from nearby Silver Creek were variously anomalous in lead, silver, mercury, zinc, manganese, and tungsten. Samples contained maximums of 13 ppb gold, 165 ppm (5 oz/ton) silver, 3.1 percent lead, 2.4 percent zinc, 3.5 percent manganese, 1,510 ppm tungsten, and 1,150 ppb mercury. One 2-ft-long chip sample contained 1.8 percent lead, 1.7 percent zinc, and 0.15 percent tungsten. Mineral resources were not delineated because of the lenticular nature of the tactites and poor exposures.

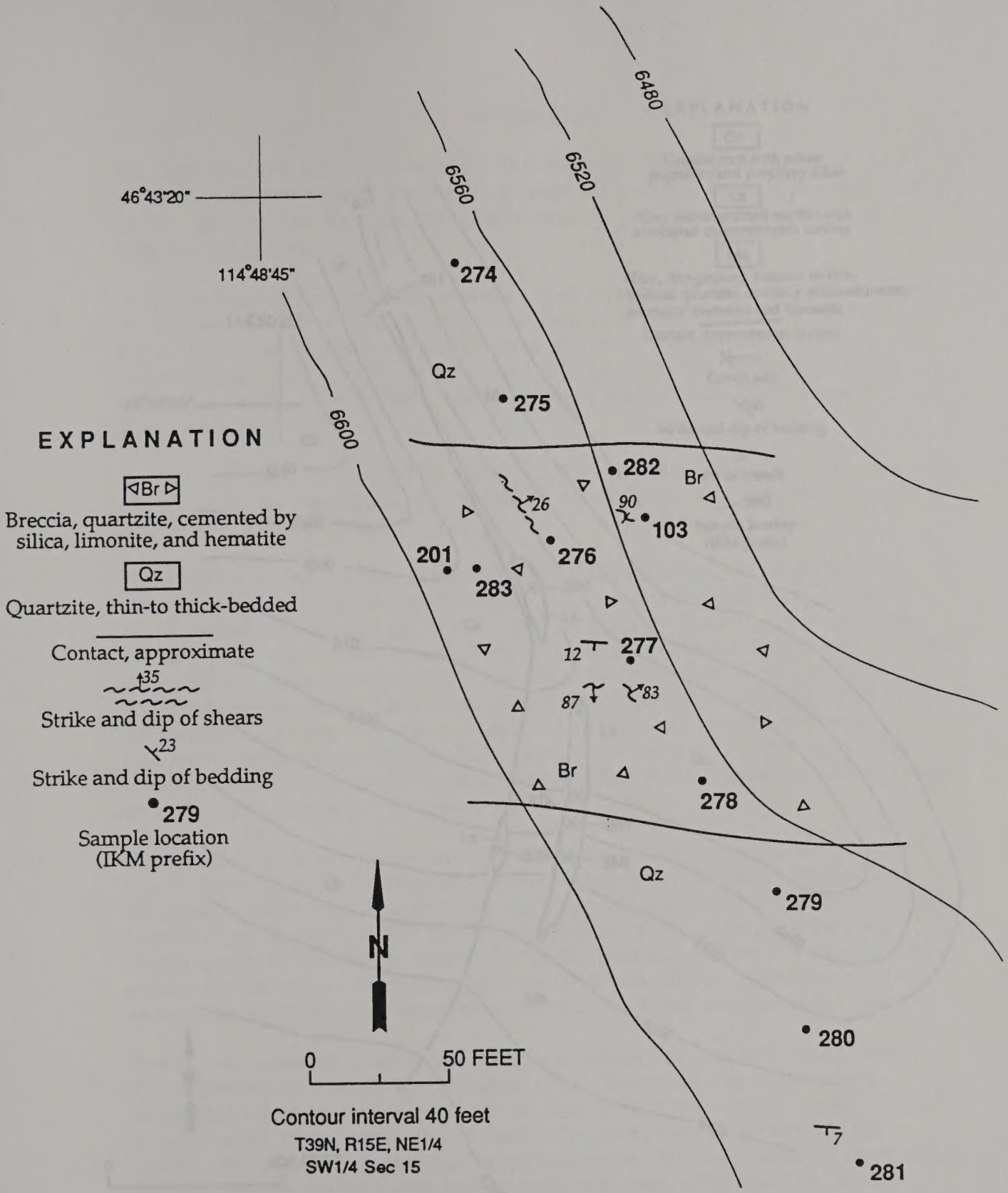
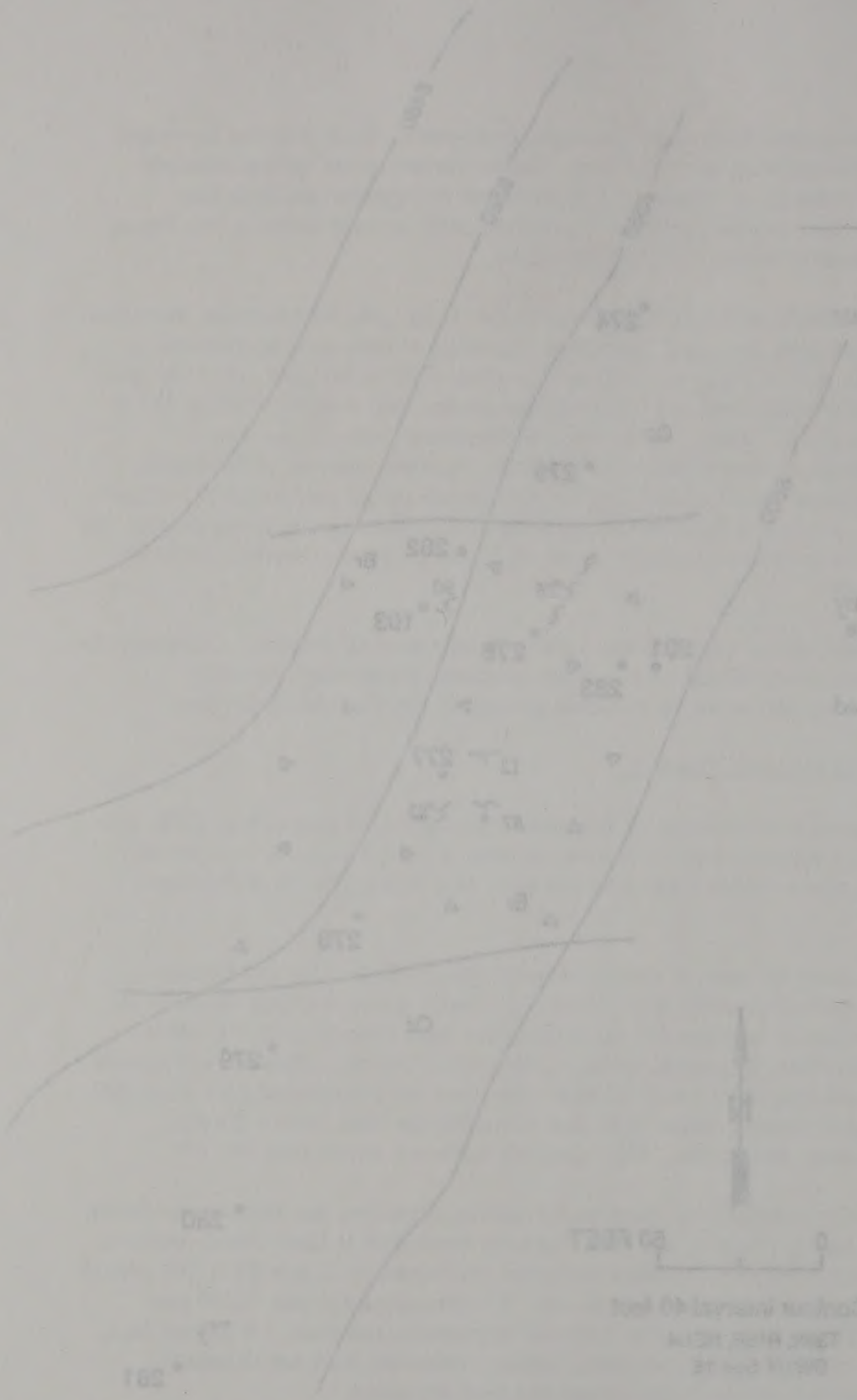


Figure 10.- Sample localities and geology at Shale Mountain gold occurrence, Kelly-Cayuse study area, Clearwater County, Idaho



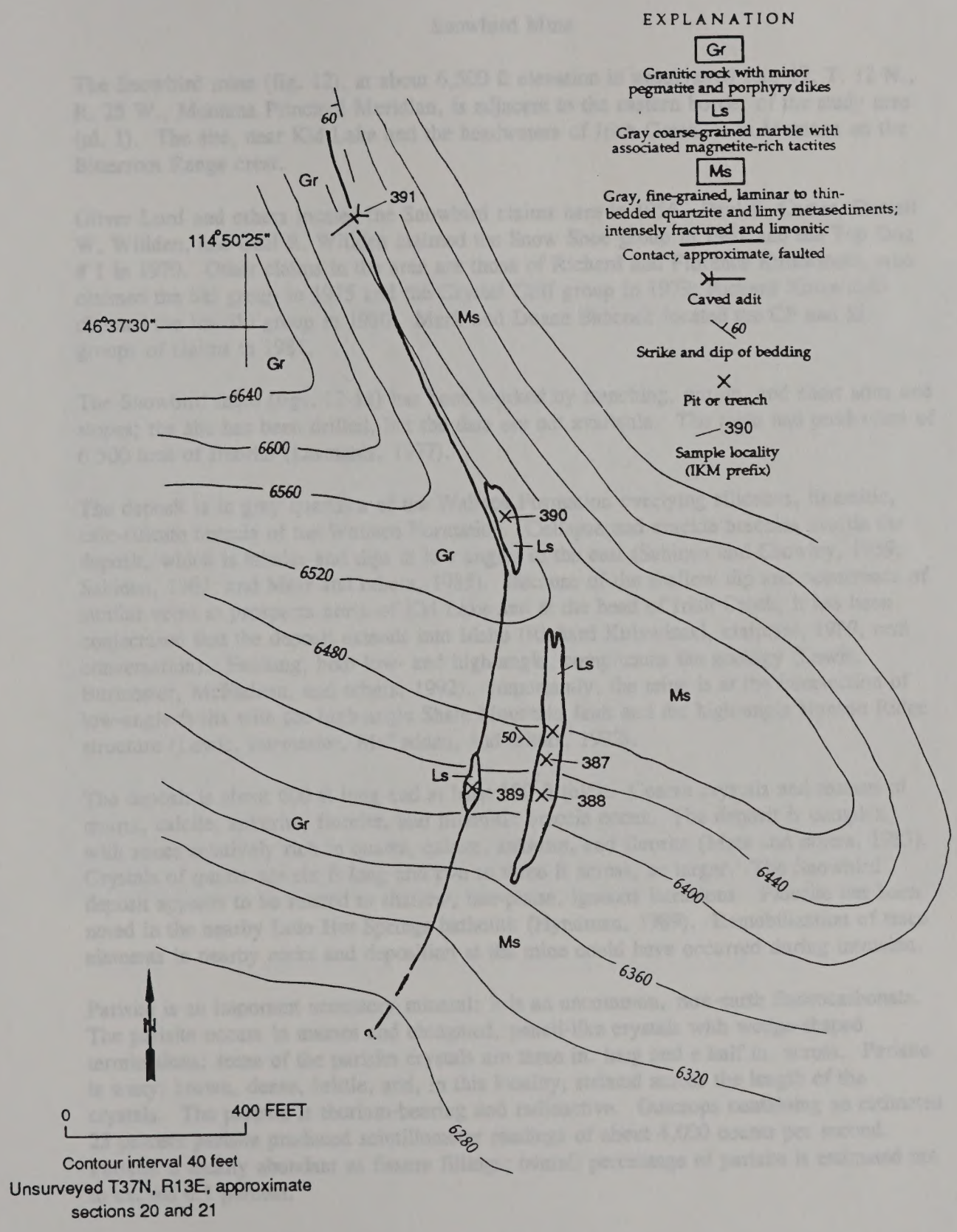


Figure 11.- Sample localities and geology at southeast Blacklead Mountain prospect, Kelly-Cayuse study area, Clearwater County, Idaho

Snowbird Mine

The Snowbird mine (fig. 12), at about 6,500 ft elevation in unsurveyed sec. 19, T. 12 N., R. 25 W., Montana Principal Meridian, is adjacent to the eastern border of the study area (pl. 1). The site, near Kid Lake and the headwaters of Irish Creek, is in Montana on the Bitterroot Range crest.

Oliver Lord and others located the Snowbird claims here in 1956. Paul E. Carter, Darrell W. Willden, and Carl R. Willden claimed the Snow Shoe group in 1967 and the Top Dog # 1 in 1970. Other claims in the area are those of Richard and Florence Kulawinski, who claimed the Ski group in 1975 and the Crystal Cliff group in 1979; Richard Kulawinski claimed the Ida-Ski group in 1980. Mark and Duane Babcock located the CP and SL groups of claims in 1981.

The Snowbird mine (figs. 12-14) has been worked by trenching, pitting, and short adits and stopes; the site has been drilled, but the data are not available. The mine had production of 6,500 tons of fluorite (Lasmanis, 1977).

The deposit is in gray quartzite of the Wallace Formation overlying siliceous, limonitic, calc-silicate breccia of the Wallace Formation. Collapse and crackle breccias overlie the deposit, which is tabular and dips at low angles to the east (Sahinen and Crowley, 1959; Sahinen, 1962; and Metz and others, 1985). Because of the shallow dip and occurrence of similar veins at prospects north of Kid Lake and at the head of Irish Creek; it has been conjectured that the deposit extends into Idaho (Richard Kulawinski, claimant, 1989, oral conversation). Faulting, both low- and high-angle, complicates the geology (Lewis, Burmester, McFaddan, and others, 1992). Importantly, the mine is at the intersection of low-angle faults with the high-angle Shale Mountain fault and the high-angle Hanson Ridge structure (Lewis, Burmester, McFaddan, and others, 1992).

The deposit is about 600 ft long and at least 100 ft thick. Coarse crystals and masses of quartz, calcite, ankerite, fluorite, and limonitic breccia occur. The deposit is complex, with zones relatively rich in quartz, calcite, ankerite, and fluorite (Metz and others, 1985). Crystals of quartz are six ft long and two to three ft across, or larger. The Snowbird deposit appears to be related to shallow, late-phase, igneous intrusions. Fluorite has been noted in the nearby Lolo Hot Springs batholith (Hyndman, 1989). Remobilization of trace elements in nearby rocks and deposition at the mine could have occurred during intrusion.

Parisite is an important accessory mineral; it is an uncommon, rare-earth fluorocarbonate. The parisite occurs in masses and elongated, pencil-like crystals with wedge-shaped terminations; some of the parisite crystals are three in. long and a half in. across. Parisite is waxy, brown, dense, brittle, and, in this locality, striated across the length of the crystals. The parisite is thorium-bearing and radioactive. Outcrops containing an estimated 25 percent parisite produced scintillometer readings of about 4,000 counts per second. Parisite is locally abundant as fissure fillings; overall percentage of parisite is estimated not to exceed 0.1 percent.

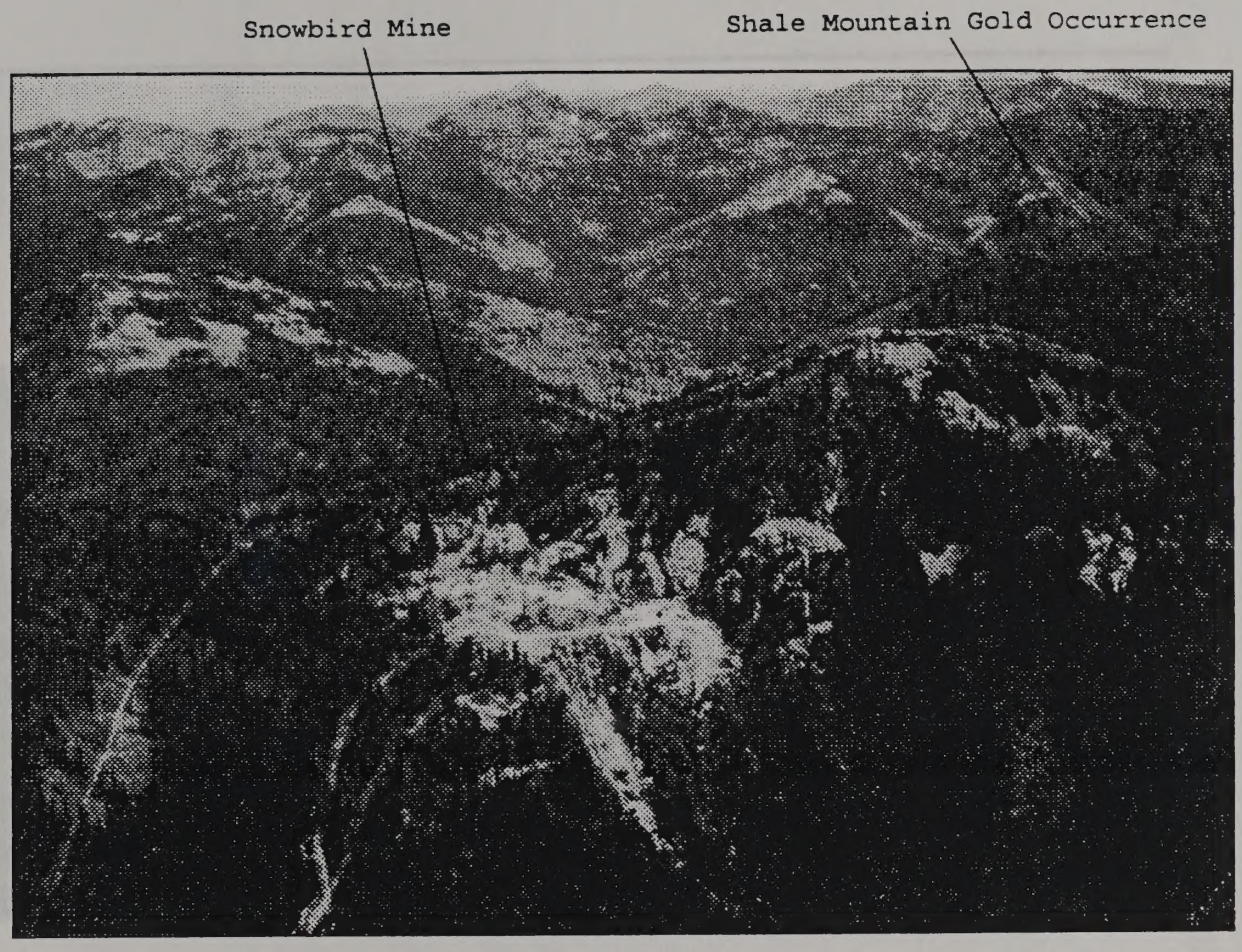
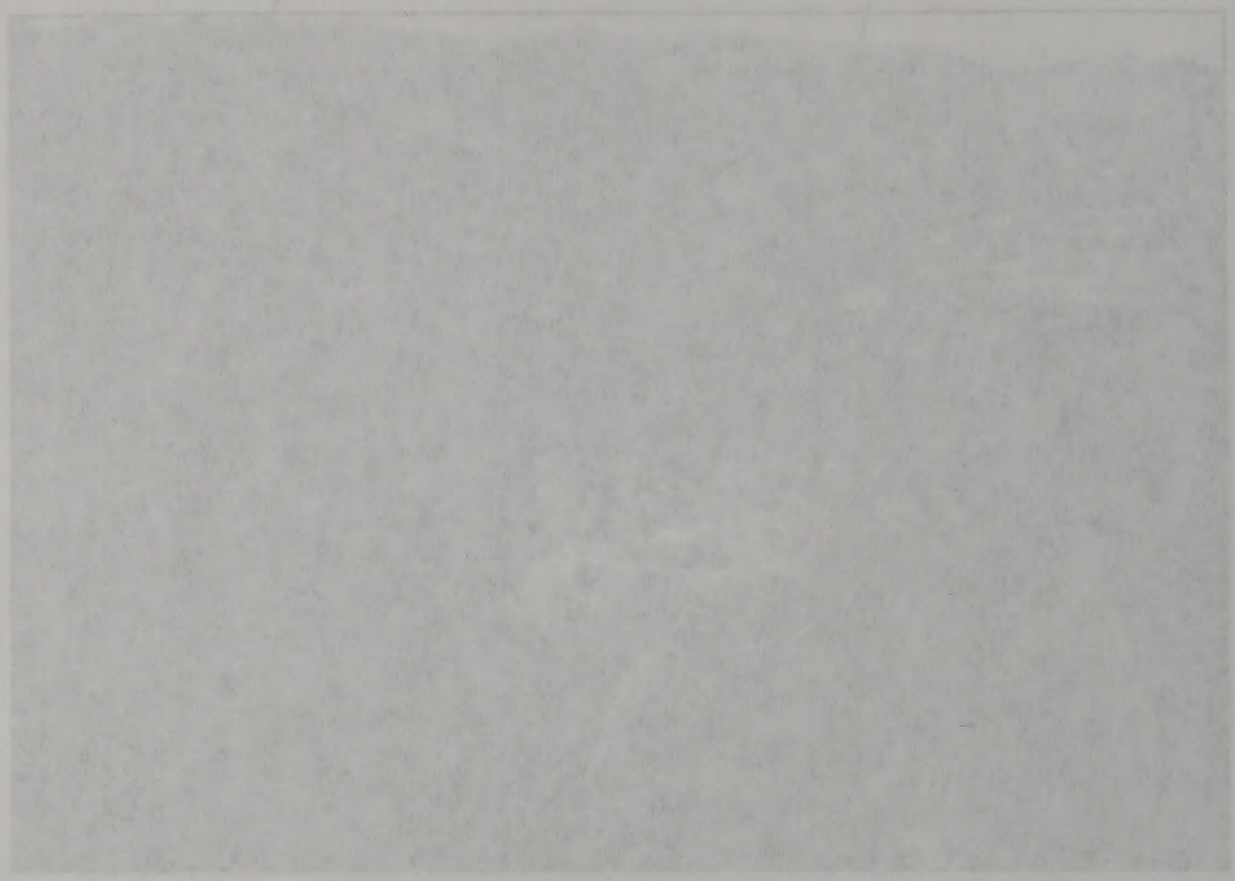


Figure 12.--Snowbird mine and Shale Mountain gold occurrence.



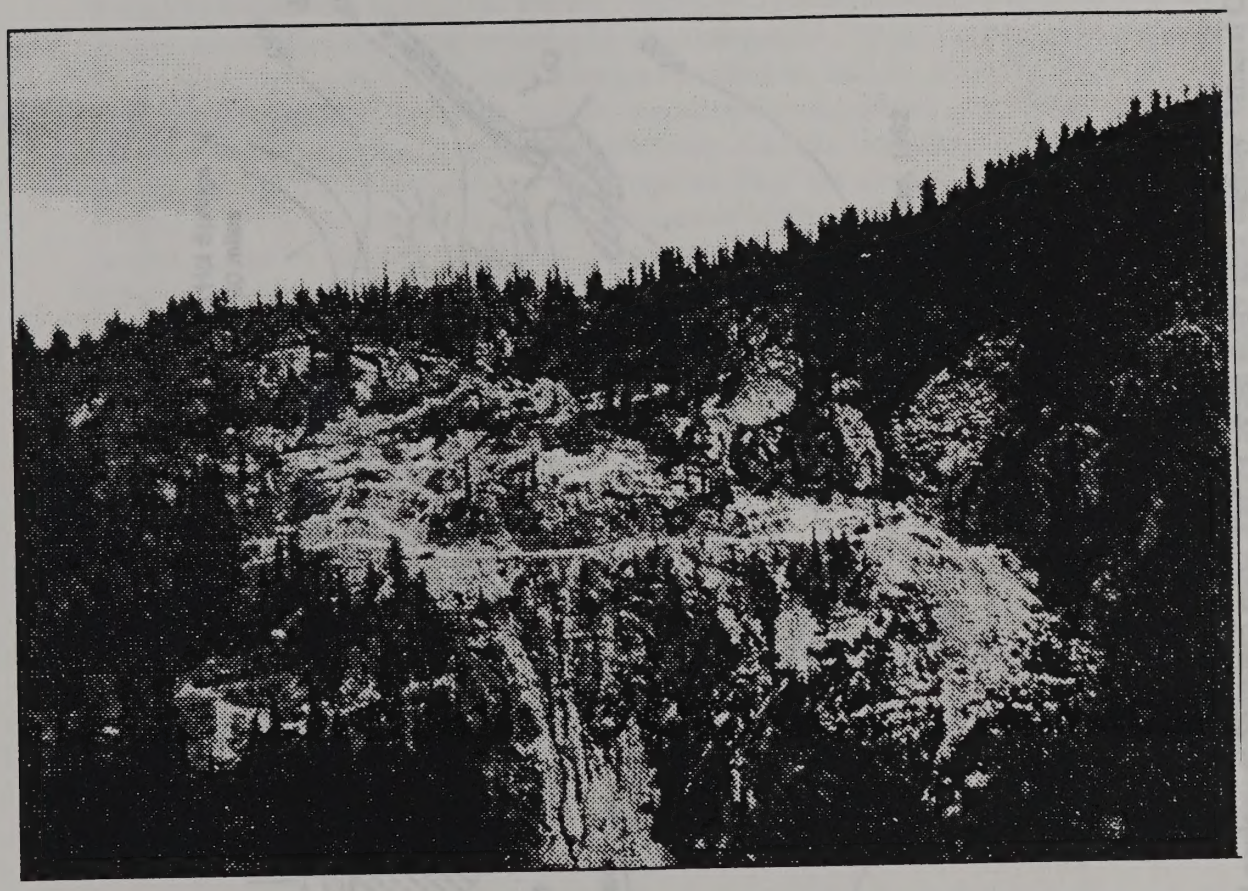
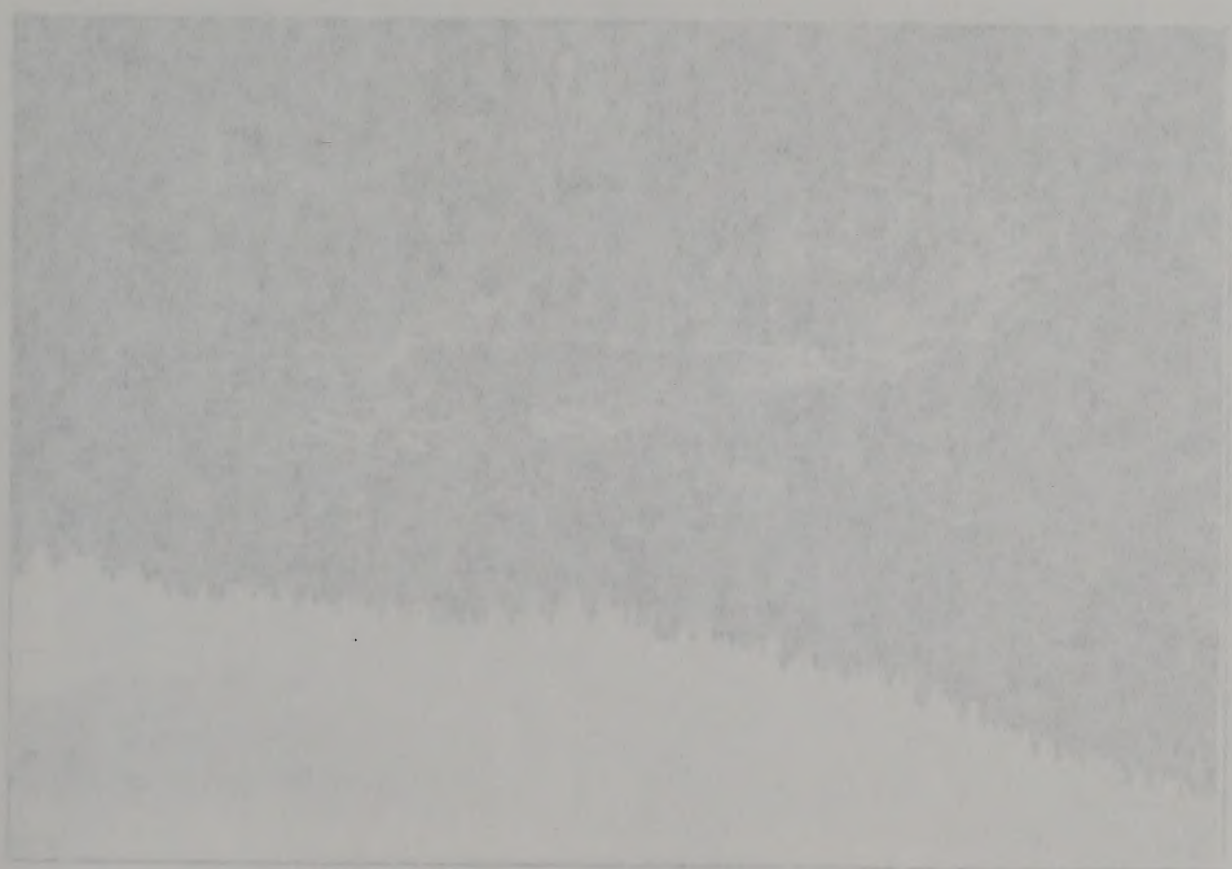


Figure 13.--Snowbird mine, Kelly-Cayuse study area vicinity, Mineral County, Montana



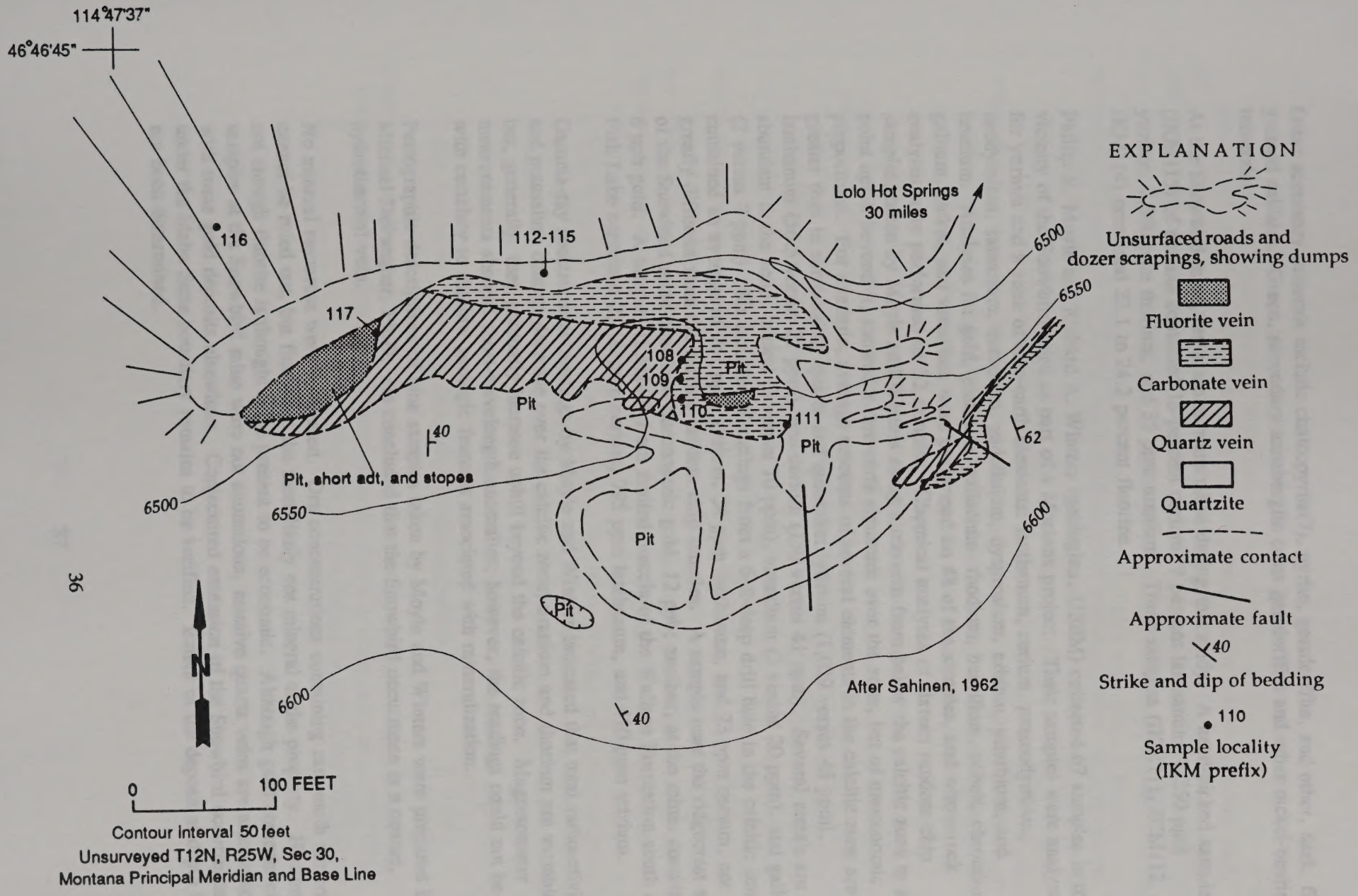


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Figure 14.- Sample localities and geology at Snowbird mine, Kelly-Cayuse study area vicinity, Mineral County, Montana

Other accessory minerals include chalcopyrite(?), pyrite, gersdorffite, and other, dark, fine-grained sulfides. Green, secondary annabergite coats gersdorffite and other nickel-bearing minerals.

At the Snowbird mine, ten samples were taken during this study. A hand-picked sample (IKM115) of parisite contained 18 percent cerium, 7 percent lanthanum, 7,250 ppm yttrium, 7,500 ppm thorium, and 35 ppm uranium. Three samples (IKM111, IKM112, and IKM114) contained 22.1 to 24.2 percent fluorine.

Phillip R. Moyle and Richard A. Winters (geologists, USBM) collected 67 samples in the vicinity of the Snowbird mine as part of a Montana project. Their samples were analyzed for yttrium and a suite of rare-earth elements: lanthanum, cerium, praseodymium, neodymium, samarium, europium, gadolinium, dysprosium, erbium, ytterbium, and lutetium. Analyses for gold, platinum, palladium, rhodium, beryllium, cobalt, chromium, gallium, nickel, and vanadium were performed on 48 of the samples, and whole-rock analyses were performed on 32 samples. Chemical analyses of sixteen random chip samples, taken by Moyle and Winters along a traverse from below the calcitic zone to a point uphill beyond it, showed a rare-earth signature over the zone, but of uneconomic proportions. For example, average amounts of several elements in the calcitic zone are greater than in surrounding quartz and quartzite: yttrium (1,029 versus 45 ppm), lanthanum (56.5 versus 21 ppm), and cerium (150 versus 41 ppm). Several metals are less abundant in the zone: nickel (3 versus 10 ppm), vanadium (3 versus 20 ppm), and gallium (2 versus 7 ppm). Six samples of cuttings from a 6-ft-deep drill hole in the calcitic zone contained an average of 741 ppm yttrium, 24 ppm lanthanum, and 73 ppm cerium, not greatly different from the surface random chip samples. A sample near the ridgecrest south of the Snowbird mine contained uneconomic gold, 12 ppb; another, at the mine, contained 6 ppb gold. A sample (IKM144) from faulted breccia of the Wallace Formation south of Fish Lake contained 2,100 ppm cerium, 795 ppm lanthanum, and 410 ppm yttrium.

Gamma-ray spectrometer readings by Moyle and Winters indicated that total radioactivity and potassium content decrease over the calcitic zone; uranium and thorium are variable, but, generally, they gradually increase uphill beyond the calcitic zone. Magnetometer measurements showed short-wavelength anomalies; however, the readings could not be tied with certainty to shallow geologic features associated with mineralization.

Petrographic descriptions of nine samples taken by Moyle and Winters were prepared by Michael DePangher, Ph.D. He concluded that the Snowbird occurrence is a coarse, hydrothermal vein.

No mineral resources were delineated. Ore concentrations containing rare-earth minerals cannot be ruled out, but fluorite is the most likely ore mineral at the property. However, not enough fluorite is thought to be present to be economic. Although gold contents of samples at the Snowbird mine were not anomalous, massive quartz veins are associated with some gold deposits elsewhere. Conjectured extension of the Snowbird occurrence under the Idaho State boundary remains to be verified. Extent of the deposit at depth has not been determined.

Weitas Area

Many historical claims, mainly placer, were located (see Zilka and others, 1987) along Orogrande, Weitas, Hemlock, and Belle Creeks in the western part of the area (pl. 1). The Musselshell and Oxford mining districts adjoin the Weitas area. A few small prospect pits, dozer scrapes, and roads are the only workings.

Nearby granitic rocks influencing mineralization in the Weitas area include the Tertiary-age Horseshoe Lake stock and Bungalow pluton. Porphyritic and brecciated, fine-grained, intrusive and volcanic rocks crop out in the study area. Gneiss, schist, quartzite, and quartz veins crop out, and small, lenticular, simple pegmatite veins also occur. Faults, especially the Kelly Forks fault, influenced mineralization here. An unusual concentration of high-angle faults fanning out to the southeast along the branches of Weitas Creek (Lewis, Burmester, McFaddan, and others, 1992) focused mineralization there.

Tungsten, cerium, fluorescent minerals (zircon), radioactive minerals (monazite), and garnet sand are most abundant in alluvium in this southwest quadrant of the study area, especially south and west of Weitas Creek (pl. 1). A rock sample (IKM436) and twelve anomalous alluvial-concentrate samples (IKM199P, IKM255P, IKM327P, IKM354P, IKM357P, IKM361P, IKM410P, IKM411P, IKM414P, IKM418P, IKM423P, and IKM430P) contained variously anomalous tungsten, gold, and cerium and one or more anomalies in copper, zinc, molybdenum, mercury, barium, and silver. Also, three concentrates near the mouths of Little Weitas and Johnagan Creeks contained traces of non-placer gold. An explanation for the tungsten anomalies and alluvial garnet is the probability of small, unmapped tactites occurring in this area (Reed Lewis, IGS, 1992, oral communication), which is near the roof of the Idaho batholith. Tungsten-bearing traces of a fine alluvial mineral, wolframite(?), were detected and could have been derived from quartz veins and pegmatite in schist and gneiss. Likewise, the traces of monazite and zircon could have accompanied wolframite deposition in pegmatites and veins in metamorphic rocks (Deer and others, 1962).

No mineral resources were delineated in the Weitas area.

Miscellaneous Lode Mineral localities

Miscellaneous lode mineral localities in the Kelly-Cayuse study area are summarized briefly (table 2). These sites, some of which are mentioned in discussions of study-area mineral regions, are not known to contain mineral resources.

Table 2.--Miscellaneous lode mineral localities in the Kelly-Cayuse study area, Shoshone, Clearwater, and Idaho Counties, Idaho

Name	Geology	Workings	Sample Data
Ann Dee prospect (About 3 mi SE. of Moose City)	White, vuggy, limonitic quartz vein, as thick as two ft, in calc-silicate country rock, poorly exposed.	Caved shaft about 7 ft deep.	Sample IKM036 contained no anomalous analyses.
Beaver Dam Saddle prospect (At SW. tip of study area)	Limonitic, white, fractured, poorly exposed quartz veins with an estimated 5 percent pyrite cubes and blebs to 1/4 in. in granitic rock.	Small pit.	Samples IKM426-IKM428 contained no anomalous analyses
Beaver Saddle prospect (At SW. tip of study area)	A poorly exposed, simple, quartz-, feldspar-, and biotite-rich pegmatite. Quartz-vein and pegmatite float occurs over an area about 100 ft on a side.	Dozer scrapings about 50 ft by 100 ft by 3 ft deep.	Sample IKM429 contained no anomalous analyses.
B. and B. prospect (About 5 mi W. of Papoose Saddle)	Limonitic, vuggy, rhyolite dike, simple pegmatite, granitic and calc-silicate rocks, and fine- to coarse-grained alluvium.	Small pits and dozer scrapings.	Sample IKM165 contained 630 ppm lanthanum and 1,675 ppm cerium--not economic.
C.A.O. claims (At SW. tip of study area)	Sparsely limonitic quartzite on ridgecrest.	None.	Sample IKM433 contained no anomalous analyses.

Table 2.--Miscellaneous lode mineral localities in the Kelly-Cayuse study area, Shoshone, Clearwater, and Idaho Counties, Idaho--Continued

Name	Geology	Workings	Sample Data
Emma claim (About half way up Weitas Creek in W. part of study area)	Coarse gravel of granitic, pegmatitic, and porphyritic rock in area of schist, gneiss, pegmatite, and porphyritic rock.	None.	A sample concentrate, IKM354P, contained slightly anomalous, uneconomic molybdenum (4 ppm).
Fetch claims (At east end of study area)	Granitic rock crops out near the Crooked Fork volcanic plug.	None.	Analyses for concentrates from samples IKM269P and IKM270P were variously anomalous, but not economic, in lead, manganese, and mercury.
Galena claim (Near mouth of Cayuse Creek)	Sheared calc-silicate rock with minor limonite at contact with granitic migmatite.	None.	Sample IKM477 analyses were not anomalous.
Granite Pass prospect (At E. side of the study area)	Gray, weathered, limonitic, argillized porphyritic volcanic rocks in granitic rocks with minor pegmatites; sparse, small quartz-crystals. Shear zones are extensions of Papoose Saddle fault.	Small pits and trenches.	Sample IKM497 analyses were not anomalous
Idaho claims (At SW. tip of study area)	Limonitic quartz in pegmatitic schist, gneiss, and granitic rocks.	Dozer scrapes.	Sample IKM432 analyses were not anomalous.

Table 2.--Miscellaneous lode mineral localities in the Kelly-Cayuse study area, Shoshone, Clearwater, and Idaho Counties, Idaho--Continued

Name	Geology	Workings	Sample Data
Lost Mine (In northeast corner of study area)	Sheared calc-silicate breccia of the Wallace Formation crops out near a high-angle fault.	A short, caved adit and at least two small pits.	Sample analyses of IKM146, IKM147, IKM210, and IKM211 were not anomalous.
Lucky Ann/Lucky Jo claims (About 3 mi NW. of Shale Mountain)	White, massive, medium-grained quartzite layer about 25 ft thick in schist and brecciated, limonitic, silicified, calcareous siltite.	None.	The silica was low grade but is similar to silica caps on hydrothermal systems. Sample analyses of IKM054 and IKM055 were not anomalous.
Magary Camp (In center of SW. quarter of study area)	Granitic rocks, schist, gneiss, pegmatites, and quartz veins with related placer localities.	Reported shallow shaft (Stan Berry, 1992, oral communication) not found.	Sample analyses of IKM299P, IKM351P, IKM420P, and IKM421 were not anomalous.

Table 2.--Miscellaneous lode mineral localities in the Kelly-Cayuse study area, Shoshone, Clearwater, and Idaho Counties, Idaho--Continued

Name	Geology	Workings	Sample Data
Marten Hill prospect (In the south central part of the study area)	Tertiary granitic rock of the Horseshoe Lake stock is crosscut by several high angle faults; siliceous, argillaceous, limonitic alteration has occurred.	None.	Analyses of 9 rock samples and 12 alluvial sample concentrates were not anomalous. Sample IKM405 contained 35 ppm thorium and 9 ppm uranium, noneconomic amounts, in the vicinity of anomalous sites described by Madson and others (1983).
Mayfield claims (About 2 mi E. of mouth of Kelly Creek)	Intensely limonitic, quartzose, pyritic lens in sheared biotite gneiss trending N. 65° W. and dipping 45° SW, but contorted.	None.	Sample IKM004 was strongly anomalous in copper (4,750 ppm), but amounts of all elements were uneconomic.
Mica group (Near Seven Mile Point in W. part of study area)	Gray, micaceous quartzite with limonite and cross-cutting pegmatites.	Dozer scrapes.	Sample analyses of IKM502 were not anomalous.

Table 2.--Miscellaneous lode mineral localities in the Kelly-Cayuse study area, Shoshone, Clearwater, and Idaho Counties, Idaho--Continued

Name	Geology	Workings	Sample Data
Mink Creek prospect (About 2 Mi. NW of Blacklead Mountain)	Limonitic, argillic, altered granitic rocks.	Three shallow dozer trenches near road.	Sample IKM222 analyses were not anomalous.
Minnie Mae claim (About 2 mi W. of Snowbird Mine)	Contorted, brecciated, limonitic carbonate zones in metasediments. Southwest dipping.	None.	Sample IKM056 analyses were not anomalous.
Petes Fork Junction prospect (At SW. tip of study area)	Quartz and associated pegmatite.	None.	Sample IKM409 analyses were not anomalous.
Red Lead claims (Near Blacklead Mountain)	Granitic and porphyritic rhyolitic, dacitic, andesitic rocks, locally sheared and fractured, with limonitic zones.	Two small pits in vicinity.	Sample analyses of IKM076 and IKM193 were not anomalous.
White Bear prospect (On Bruin Hill)	Calc-silicate rock in area of gray granodiorite with black-veined silicic alteration.	Three small pits.	Sample analyses of IKM106, IKM107, and IKM212 were not anomalous.

Table 2.--Miscellaneous lode mineral localities in the Kelly-Cayuse study area, Shoshone, Clearwater, and Idaho Counties, Idaho--Continued

Name	Geology	Workings	Sample Data
Whitelead claims (About 2 mi W. of Shale Mountain)	White, massive, quartz lens in calc-silicate country rock.	None.	The silica was low grade but similar to silica caps on hydrothermal systems. Sample analyses of IKM080 and IKM242 were not anomalous.
White Rock claims (At southeast corner of study area)	Lenticular quartz veins in volcanic rock, schist, gneiss, and	None.	An alluvial sample and seven rock samples were taken. Only one rock sample analysis (IKM494) was anomalous, but not economic; it showed 1,265 ppb mercury.

Placer Localities

Gold occurs in alluvium at numerous localities in the study area and vicinity. Placer claims are concentrated near Moose City, along North Fork Clearwater River, and along Kelly, Cayuse, Orogrande, Weitas, Middle, and Hemlock Creeks. General nature of the placers is summarized in the text; sample description tables (A-1 and A-3) contain details.

Placer gold in the study area is locally coarse. One nugget found along Moose Creek weighed about 2.25 oz (James Yount, claimant, 1991, oral communication). This tabular, rounded, specimen nugget appears brassy, looks laminose, and has curved extremities, which were apparently bent by boulders rolling along the stream bed. An even-larger nugget was reported to have been found nearby (Henry Hellman, claimant, 1990, oral communication).

Recent Gravel

Alluvium along floodplains and in benches in the Moose City area is as thick as 30 ft; most gravel is 5 to 10 ft thick. Floodplains are several hundred ft wide; bedrock is level, although rough and creviced. Coarse, bouldery gravel, mainly composed of schist, gneiss, quartzite, quartz, and granitic rocks, is subangular to rounded, with sparse clay layers.

Gravel accumulations along North Fork Clearwater River, Kelly Creek, Cayuse Creek, and Weitas Creek are mostly along wide, flat alluvial plains, many of which are thousands of ft wide and several mi long. Bedrock, crudely level, is locally rough and corrugated. Gravel is thin, 5 to 10 ft thick in most areas. However, at the larger bars, gravel accumulations occur in several terraces, each 10 to 20 ft thick. Alluvial fans at the mouths of tributary streams locally thicken the gravel. Coarse, bouldery gravel constituents are mainly subangular to subrounded and composed largely of diverse mixtures of granitic rocks, gneiss, schist, porphyritic volcanic rocks, quartzite, pegmatite, vein quartz, and calc-silicate rock. Sand, with a few clay beds, predominates at some bars, especially near the surface.

Besides gold, heavy minerals in the gravel along active streams include noneconomic amounts of cinnabar, mercury, garnet, magnetite, ilmenite, rutile, zircon, corundum(?), and rare-earth minerals.

The approximate range of gold values in gravel along streams and in Tertiary-age gravel near Moose City is from \$1 to \$10/yd^3 of gravel. Gravel mined here by sluicing, hydraulicking, and large-scale dredging contained from about 0.003 to about 0.03 oz/yd^3 gold (USBM unpublished production records). Small-scale, suction-dredge miners were recovering from about 0.02 to about 0.1 oz of gold per average hour of intermittent operation at as many as six sites near Moose City. The gold is concentrated on bedrock, and is especially rich in some crevices; however, overlying gravel contains significant values (James Yount, claimant, 1990, oral communication). About 0.05 oz of gold per day of dredging was being recovered on the Last Chance claim, on North Fork Clearwater River near the mouth of Weitas Creek (William Bolen, claimant, 1990, oral communication). Gold values vary widely in small samples of the alluvium because of bouldery gravel and scattered distribution of relatively coarse gold.

Some alluvium in the study area, especially near Moose City, has been dredged several times. Loss of gold from past mining, slough from stream banks, influx from tributary streams, discovery of unworked gravel, and redistribution of gold during high runoff enable continued recovery of gold. Also, more efficient equipment and gold prices that have increased by a factor of approximately ten encourage recovery of gold lost by earlier miners.

Ilmenite, an iron- and titanium-rich mineral, occurs as angular chunks as large as 0.75 in. along Moose Creek. The concentrations, of approximately six to eight pounds of ilmenite per cubic yard of gravel (unpublished U.S. Bureau of Mines data, 1957), are not economic, by a factor of at least five times because of low grade. Additionally, a sample (IKM034P) of ilmenite(?) from Moose Creek contained 60.2 percent iron but only 8.5 percent titanium. Fine-grained sands composed of garnet, zircon, and red rutile occur in traces along Ruby Creek and are likewise not economic. Cinnabar, mercury, magnetite, rare-earth minerals, and corundum(?) are too scarce in study area gravel to be economic by themselves. Recovering these minerals as byproducts during large-scale gold placer mining might be feasible.

Gold values and mineral resources were delineated for two drainages: Moose Creek and North Fork Clearwater River. Expansion of gravel by 25 percent during excavation is assumed. Dilution of gold values by boulders is, however, not calculated; most of the placer gold values should be decreased by about 40 percent to account for boulders. Likewise, gold values are not decreased to reflect actual fineness, estimated to be about 850. Less-than-perfect gold recovery should also be considered. On the other hand, premium value of specimen-grade gold nuggets is not considered.

About 2.8 million yd^3 of mostly inferred gold-bearing gravel are delineated for Moose Creek downstream from the mouth of Deadwood Creek. Gold content of this gravel is estimated at about 0.01 oz/yd^3 ($3.80/$yd^3$ at a gold value of $380/oz), using gold production of present-day suction-dredge mining, historical production from the Moose City area, and samples taken from Moose Creek during this study.

About 18 million yd^3 of mostly inferred gravel are delineated for North Fork Clearwater River between Black Canyon and Orogrande Creek. Gold content is estimated at about 0.003 oz/yd^3 ($1.14/$yd^3$).

Gold is fed into Kelly Creek from Moose Creek, but values are diluted by admixture of abundant, relatively lean gravel from Kelly Creek: because of resulting low grade, no mineral resources are estimated for lower Kelly Creek.

Small-scale suction-dredge mining of placer gold is occurring along Moose Creek and North Fork Clearwater River; therefore placer gold at those localities is considered economic to marginally economic. Small-scale suction dredging will continue in the Moose Creek vicinity and along North Fork Clearwater River. Volumes of gravel are adequate for low-overhead, suction-dredge mining for the foreseeable future at current rates of mining. These gravels are, however, classified as marginally economic for large-scale

mining because of five reasons: low grade; uncertain gold purity; uncertainty about practicality and expense of dealing with the numerous boulders; uncertainty about recovery factors; and, uncertainty about environmental concerns and expenses.

Tertiary Gravel

Gold-bearing Tertiary-age gravel, tens of ft thick, caps some ridges, mostly outside the study area (Lewis, Burmester, McFaddan, and others, 1992). This gravel is distinctly different from gravel along active streams. The Tertiary-age gravel contains more abundant, rounder pebbles and cobbles composed of quartz, quartzite, and schist. Likewise, garnet, ilmenite, and magnetite, relatively abundant along active streams, are scarce in the Tertiary-age gravel. Many quartzose pebbles have angular molds of pyrite, some 1/4 in. across. The gravel is accompanied by brown and gray lignitic clay and silt beds.

This abundance of rounded, quartzose pebbles and cobbles is consistent with hypothesized deposition of the Tertiary-age placer gold by erosion of gold-bearing rocks during growth of ancient, nearby mountains (Earl Bennett, IGS, 1990, oral communication).

The gravel lies on intensely weathered, steeply dipping, gray to brown, limonitic biotite schist and gneiss. The gravel is mainly covered by colluvium; landslides and hydraulicked areas also obscure the geology.

Gold in Tertiary-age gravel is locally coarse, angular, and contains quartz and chalcedonic silica. Gold concentrations are locally high, as a single pan of the gravel near bedrock on the G. and G. mine contained gold and amalgam having an estimated value equivalent to more than \$100 per yd^3.

No mineral resources were delineated for Tertiary-age gravel localities because extent of the gold-bearing gravel was obscured by overburden.

Miscellaneous Alluvial Mineral Localities

Miscellaneous alluvial mineral localities, some containing placer gold, are summarized in table 3. Some of these localities are also mentioned in discussions of the mineralized regions of the study area.

Table 3.--Miscellaneous alluvial mineral localities in the Kelly-Cayuse study area, Shoshone, Clearwater, and Idaho Counties, Idaho

Name	Geology	Workings	Sample Data
Bear Creek (In the NE. center of the study area)	Epidote- and magnetite-rich alluvium composed of granitic and volcanic rocks and quartzite.	None.	Samples (IKM243P-IKM247P) contained an average of 70 ppb of non-placer gold (range 15 to 150 ppb), not economic. No visible gold was found.
Bear Waller (Near the mouth of Fourth of July Creek	Narrow valley filled by thin gravel composed of granitic rocks and pegmatite; basalt outcrops nearby.	Small pits.	A sample (IKM451P) of alluvium contained anomalous barium, 110 ppm, and 12 ppb of non-placer gold, not economic.
Bedrock Creek (E. of Toboggan Hill)	Alluvium composed mostly of quartzite, porphyritic rhyolite, and granitic fragments.	None.	A sample (IKM216P) contained a gold value of about $\$0.48/yd^3$ and anomalous silver, 6.7 ppm, not economic amounts.
Black Canyon (N. of the mouth of Kelly Creek)	Alluvium composed of granitic and porphyritic volcanic rocks, schist, gneiss, quartzite, and pegmatite; interbedded sand and clay locally.	None.	Samples (IKM455P-IKM462P and IKM475P) contained an average gold value of about $\$0.25/yd^3$, not economic.
Blackleed (Near the mouth of Rawhide Creek)	Alluvium composed of quartzite, phyllite, and schist.	None.	Nearby samples (IKM472P and IKM473P) contained variously anomalous silver, copper, and arsenic, but not in economic amounts.
Cayuse Creek (In the center of the study area)	Alluvium composed of schist, gneiss, quartzite, quartz, pegmatite, diorite, pyroxenite, and granitic, volcanic, and porphyritic volcanic rocks.	A few small pits.	Samples (IKM037P, 038P, 040P-044P, 057P, 059P, 082P, 163P, 167P, 168P, 284P, 285P, 287P, 289P, 294P, 295P, 311P, 312P, 314P-317P, 322P-325P, 332P, and 333P contained an average gold value of about $\$0.14/yd^3$, not economic.

Table 3.--Miscellaneous alluvial mineral localities in the Kelly-Cayuse study area, Shoshone, Clearwater, and Idaho Counties, Idaho--Continued

Name	Geology	Workings	Sample Data
East Saddle claims (Near mouth of Cayuse Creek)	Faulted metasedimentary rocks and granitic intrusives crop out; narrow valleys are filled by alluvium. Tertiary-age gravel (?) crops out locally.	Small, caved pits and trenches.	Rock sample IKM240 and concentrates of sample IKM061P contained anomalous, uneconomic lead. No mineral resources were delineated.
Fourth of July Creek (SE. of Pot Mountain about 7 mi)	Alluvium composed of schist, gneiss, diorite, pegmatite, tremolite schist, gabbro, quartz, and calc-silicate, granitic, and metamorphic rocks.	None.	Samples (IKM140P and IKM334P-IKM340P) contained no anomalous elemental concentrations. No mineral resources were delineated.
G. and G. mine (N. of Moose City)	Tertiary-age gravel rich in quartz and quartzite fragments overlying steeply dipping, weathered, schistose, quartz-veined bedrock.	Dozer trenches and pits feed 8-ft-diameter trommel.	A sample (IKM238P) contained maximum gold values of about $\$110/yd^3$. No resources were delineated because extent of the mineralized gravel was obscured by overburden.
Hemlock Creek (At the SW. tip of the study area)	Alluvium composed of schist, gneiss, quartzite, quartz, pegmatite, and porphyritic volcanic and granitic rocks.	None.	Samples (IKM199P, IKM411P, IKM413P, and IKM434P) contained an average gold value of about $\$0.43/yd^3$. Anomalous tungsten occurred, but was not economic. No mineral resources were delineated.
Howard Creek (In S. central part of study area)	Alluvium composed of granite, quartzite, and rhyolite.	None.	Sample (IKM313P) concentrates were anomalous, but not economic, in zinc (110 ppm) and manganese (705 ppm). The concentrate contained anomalous magnetite. This sample may indicate weak mineralization related to intrusion of the Horseshoe Lake stock.

Table 3.--Miscellaneous alluvial mineral localities in the Kelly-Cayuse study area, Shoshone, Clearwater, and Idaho Counties, Idaho--Continued

Name	Geology	Workings	Sample Data
Independence Creek placer patents (Near Moose City)	Tertiary-age gravel eroding into Independence Creek in area of schist, gneiss, quartz-vein, and pegmatite bedrock.	Hydrau-licked areas, pits, and trenches; limited drift mining.	No samples taken; production data has not been released; small-scale mining is occurring. No mineral resources were delineated for these private properties.
Kelly Creek, lower (S. of Moose Mountain)	Alluvium composed of gneiss, schist, quartzite, and granitic, volcanic, porphyritic volcanic, and calc-silicate rocks.	Small pits.	Samples (IKM134P, IKM151P-IKM153P, IKM155P, IKM198P, IKM376P, IKM465P, and IKM467P) contained an average gold value of about $\$0.30/yd^3$, not economic.
Kelly Creek, upper (In the NE. part of the study area)	Alluvium composed of siltite, quartzite, schist, gneiss, pegmatite and volcanic, porphyritic volcanic, and calc-silicate rocks.	None.	Samples (IKM045P, IKM046P, IKM079P, IKM130P-IKM133P, IKM208P, IKM241P, IKM267P-IKM268P, IKM468P-IKM469P, and IKM471P) contained an average gold value of $\$0.04/yd^3$, not economic.
Lilly placer patents (Near Moose City)	Alluvium composed of schist, gneiss, quartzite, pegmatite, and quartz.	Dredged areas.	No samples taken; production data has not been released; small-scale mining is occurring. No mineral resources were delineated specifically for this private property, which is part of the Moose Creek resource.
Little Moose Creek (In the NE. part of the study area)	Alluvium composed of quartzite, schist, gneiss, and calc-silicate rock.	None.	Samples (IKM010P and IKM213P-IKM215P; IKM148P was not used because of suspected contamination) contained an average gold value of about $\$0.15/yd^3$, not economic.

Table 3.--Miscellaneous alluvial mineral localities in the Kelly-Cayuse study area, Shoshone, Clearwater, and Idaho Counties, Idaho--Continued

Name	Geology	Workings	Sample Data
Middle Creek (In the SW. part of the study area)	Alluvium composed of quartzite, quartz, pegmatite, gneiss, schist, and porphyritic, volcanic, and granitic rocks.	None.	Samples (IKM257P, IKM422P-IKM424P) contained an average gold value of about $0.43/yd^3. Sample IKM423P concentrates also contained anomalous copper, 32 ppm, an uneconomic amount. No mineral resources were delineated.
Orogrande Creek (At the W. end of the study area)	Alluvium composed of gneiss, schist, quartzite, pegmatite, and granitic and porphyritic volcanic rocks.	None.	Samples (IKM437P-IKM440P and IKM501P) contained an average gold value of about $0.41/yd^3, not economic.
Osier Creek (Near Moose City)	Alluvium composed of quartzite, siltite, schist, gneiss, and calc-silicate and granitic rocks.	None.	Samples (IKM011P, IKM062P-IKM063P, and IKM092P-IKM093P) did not contain detectable placer gold. A sample (IKM093P) contained anomalous, but uneconomic, copper, 55 ppm. No mineral resources were delineated.
Pioneer placer patent (Near Moose City)	Tertiary-age gravel composed of quartz and quartzite.	Hydrau-licked areas.	Samples (IKM019P, IKM026P, and IKM033P) from the vicinity contained an average gold value of about $0.77/yd^3. Mineral resources were not delineated because of poor exposures. Quartz veins here contained trace gold and anomalous, but uneconomic, barium and manganese.
Ruby Creek (E. of Moose Creek Buttes)	Alluvium composed of quartzite, mica schist, gneiss, and granitic rocks.	None.	Samples (IKM064P-IKM066P and IKM217P) contained an average placer gold value of about $0.05/yd^3, an average of about 416 ppb non-placer gold, and traces of rutile and garnet, none of which are economic.

Table 3.--Miscellaneous alluvial mineral localities in the Kelly-Cayuse study area, Shoshone, Clearwater, and Idaho Counties, Idaho--Continued

Name	Geology	Workings	Sample Data
Sailor Gulch placer patent (Near Moose City)	Tertiary-age gravel composed of quartz and quartzite.	Hydraulicked areas.	A sample (IKM095P) contained a gold value of about $2.61/yd^3. No mineral resources were delineated because extent of the mineralized gravel was obscured by overburden.
Toboggan Creek (In the center of the study area)	Alluvium composed of schist, gneiss, and granitic, volcanic, and volcanic porphyritic rocks.	None.	Samples (IKM081P and IKM476P) contained no detectable placer gold. One concentrate (IKM476P) contained 10 ppb non-placer gold and anomalous copper, 42 ppm, not economic. No mineral resources were delineated.
Upper Lolo (At the SW. tip of the study area)	Alluvium composed of quartz, quartzite, schist, gneiss, and granitic and porphyritic volcanic rocks.	None.	Samples (IKM430P and IKM431P) contained no detectable placer gold; they contained 155 ppb non-placer gold and anomalous silver, copper, and cerium (respectively 2.8 ppm, 77 ppm, and 1,125 ppm), none of which is economic.
Weitas Creek (In the SW. part of the study area)	Alluvium composed of schist, gneiss, quartzite, pegmatite, and granitic, volcanic, and porphyritic volcanic rocks,	None.	Samples (IKM159P, IKM200P, IKM254P-256P, IKM352P, IKM357P, IKM359P, IKM361P, and IKM366P) contained an average gold value of about $0.28/yd^3 and occasionally anomalous, but likewise uneconomic, tungsten and cerium.

From four to eight small suction dredge mines are operated each summer on Moose Creek and North Fork Clearwater River. A typical suction dredge on Moose Creek is powered by an eight-horsepower gasoline engine and uses a 4-in.-diameter suction tube necked-down from 5 in. (fig. 15). Riffles, in a section about 2 ft wide and 3 ft long, are set at an inclination of 2 1/2 in. per ft and covered by about 2 in. of fast-moving water during operation. Riffles are about 6 in. apart and formed of one-in. angle iron, set across the sluice box and tilted at about 30° downstream for greater turbulence. Green, artificial, plastic turf is laid under the riffles. Clogging of the sluice by ilmenite and other heavy minerals is minimized by operating the sluice vigorously at a relatively steep angle and high water flow (James Yount, claimant, 1989, oral communication). Suction-dredge miners wear protective thermal suits and SCUBA, snorkeling, or pumped-air equipment to allow lengthy immersion or partial immersion in the cold water. Each suction dredger typically mines an estimated 1 to 10 yd^3 per day of operation. Mining is intermittent daily and seasonally.

Several trommels of diverse diameter are used to disaggregate and size bench gravel in preparation for sluicing. An 8-ft-diameter trommel and four wide sluices, fed by a manifold from the trommel output, are used at the G. and G. mine (figs. 16 and 17) north of Moose City. The trommel is primarily electrically operated. A 20 horsepower motor, used to drive the trommel in 1990, was scheduled to be upgraded to break down the clay-rich gravel more easily. Smaller trommels have been used along Independence Creek and on the Pioneer patented placer claim (fig. 18).

Geothermal Energy Resources

Thermal springs include Weir Creek Hot Springs and Colgate Warm Springs (pl. 1) in the south part of the study area (Weir-Post Office Creek RARE II area, fig. 2). These thermal areas are in Cretaceous-age granitic rocks near the Tertiary-age Horseshoe Lake stock at the south boundary of the study area (pl. 2). They are along extensions and branches of the Papoose Saddle fault.

The Weir Creek Hot Springs flow from fissures in granitic and andesitic rocks in a zone about 1,500 ft long near the floor of Weir Creek valley (Kuhns and others, 1980). Rustic, informal pools, constructed for bathing and swimming, are popular among hikers from U.S. Highway 12, about 0.5 mi south. Maximum temperature of the spring water is about 117.5 °F (Kuhns and others, 1980; Ross, 1971; and Goff, 1980). Water flow was reported to be 20-50 gallons per minute from five vents. Hot springs were reported to occur at the intersections of shear zones and andesitic dikes. The water has a faint, sulfurous odor. Argillic alteration of the granitic rocks has occurred; buildups of tufa are negligible.

Colgate Warm Springs flow from colluvium and several broad alluvial fans near U.S Highway 12, about a mi downstream from the mouth of Mink Creek. The thermal area is at least 500 by 500 ft in size. Tufa has built up, and clays and limonite have formed. The springs contain elements important to local game animals and are natural mineral licks. Surface water temperatures are between 102 and 106 °F. Water flow from all vents

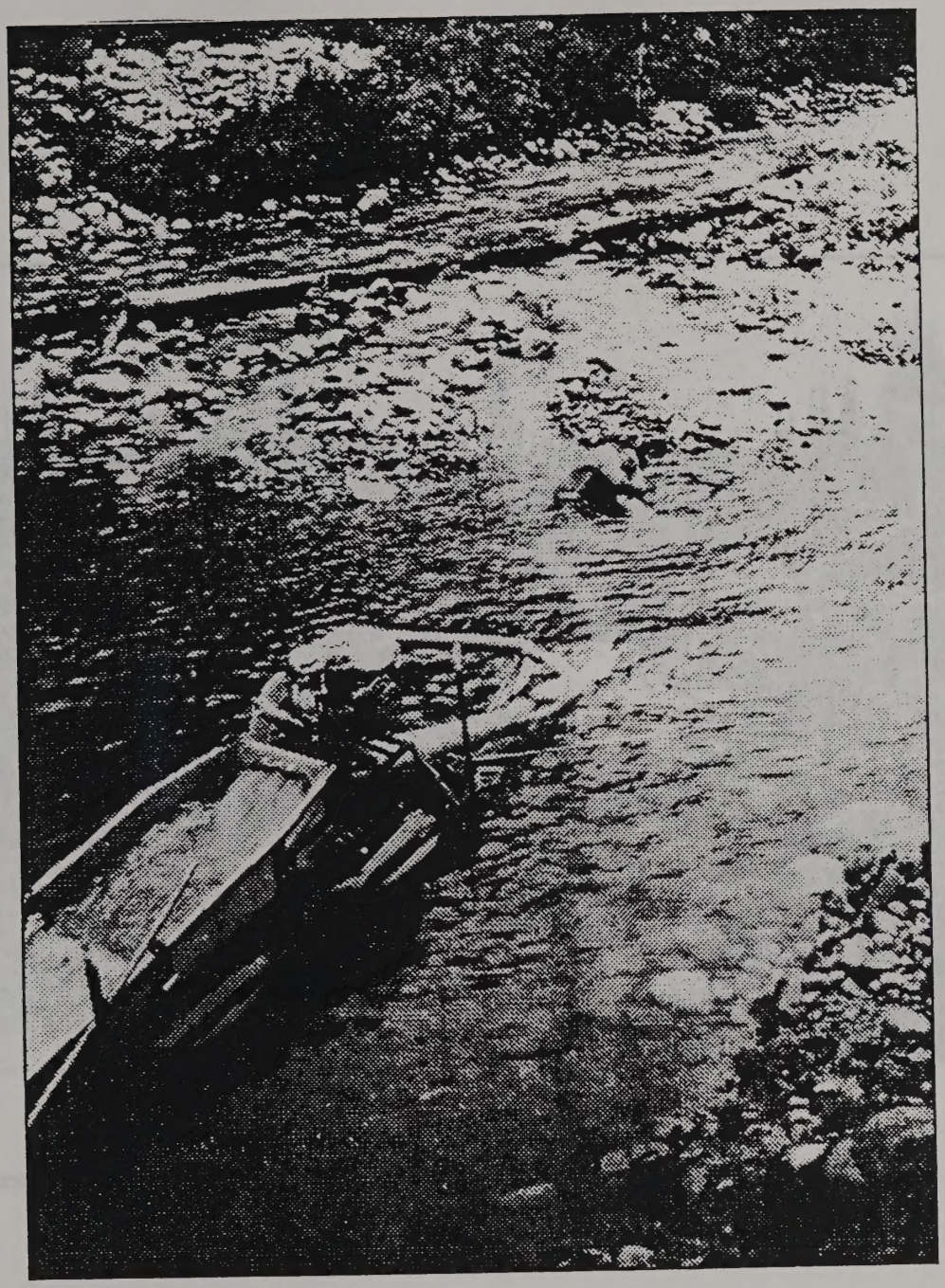


Figure 15.--Suction dredge mining on Moose Creek, Kelly-Cayuse study area, Clearwater County, Idaho

Figure 16.--Trommel at G. and G. mine, Kelly-Cayuse study area vicinity, Clearwater County, Idaho

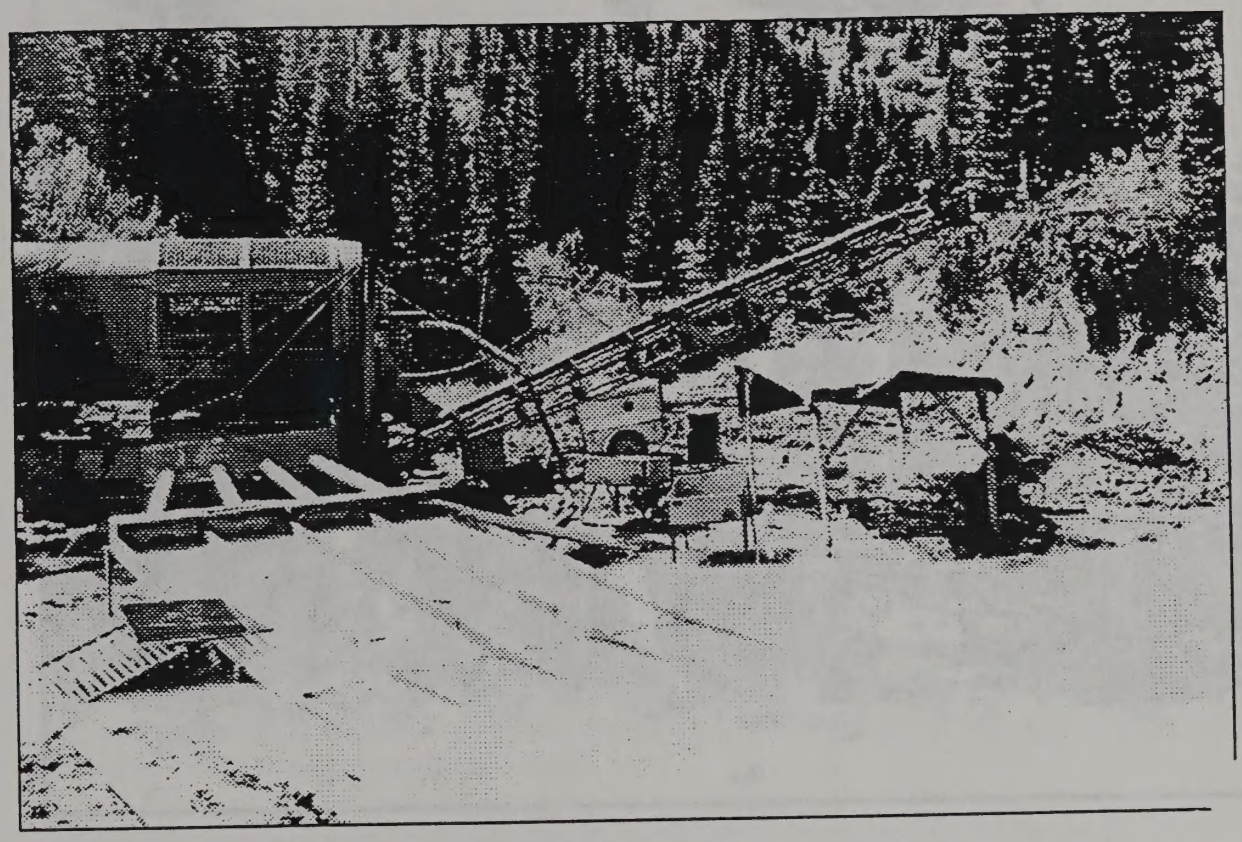
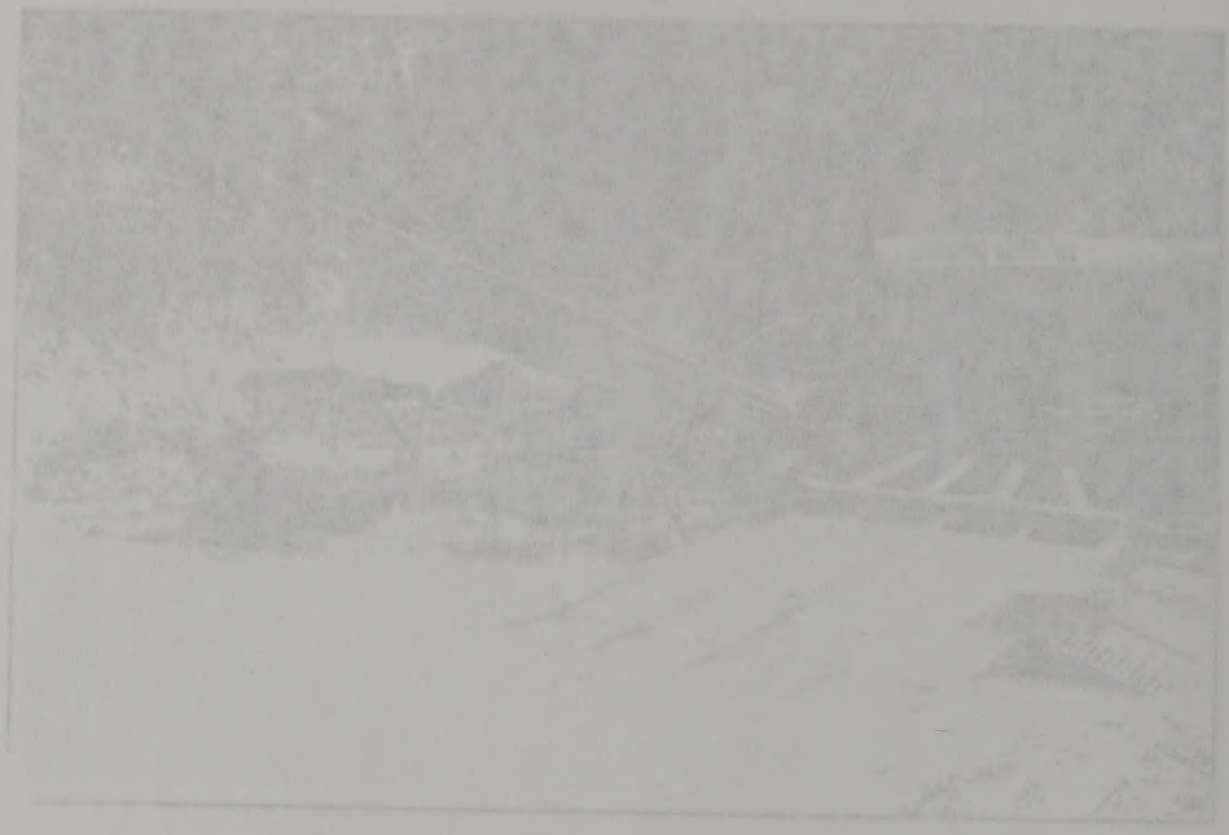


Figure 17.--Trommel and sluice boxes at G. and G. mine, Kelly-Cayuse study area vicinity, Clearwater County, Idaho



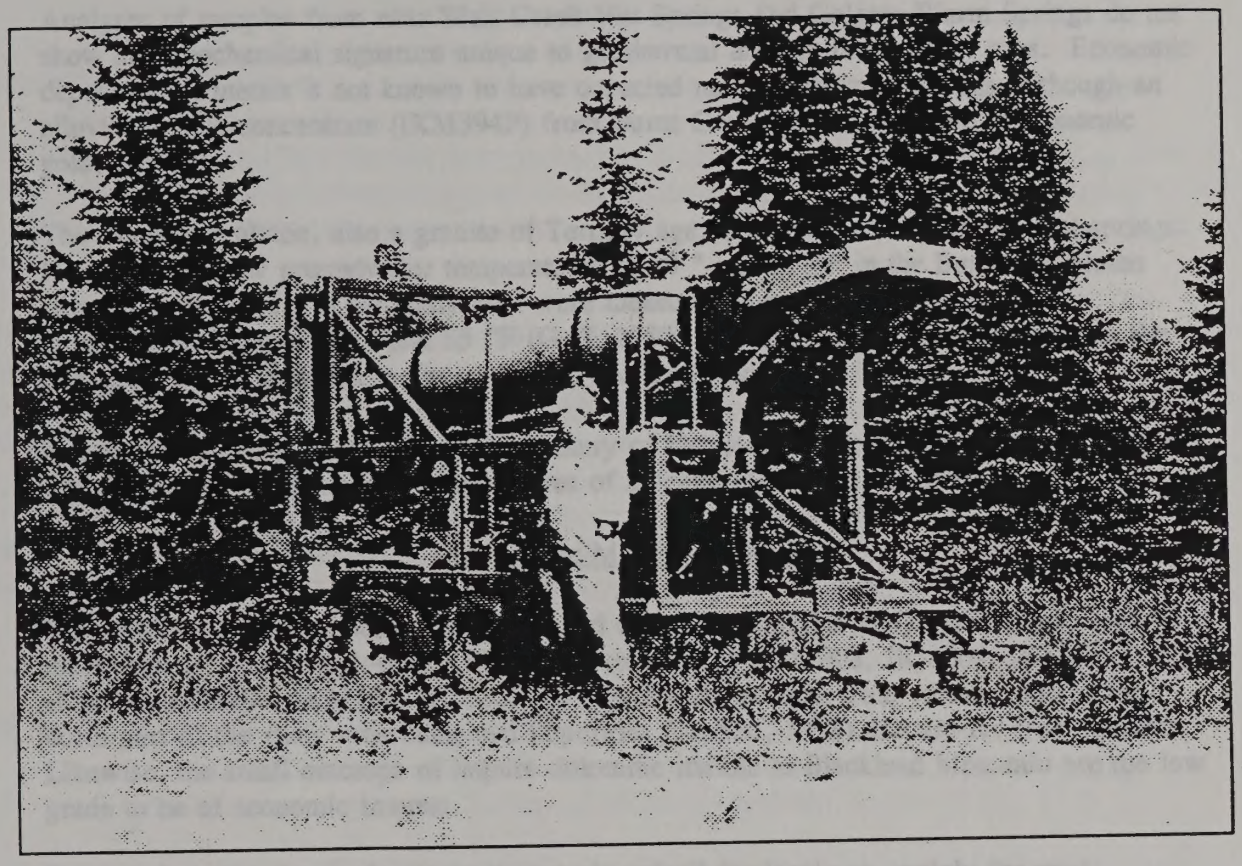
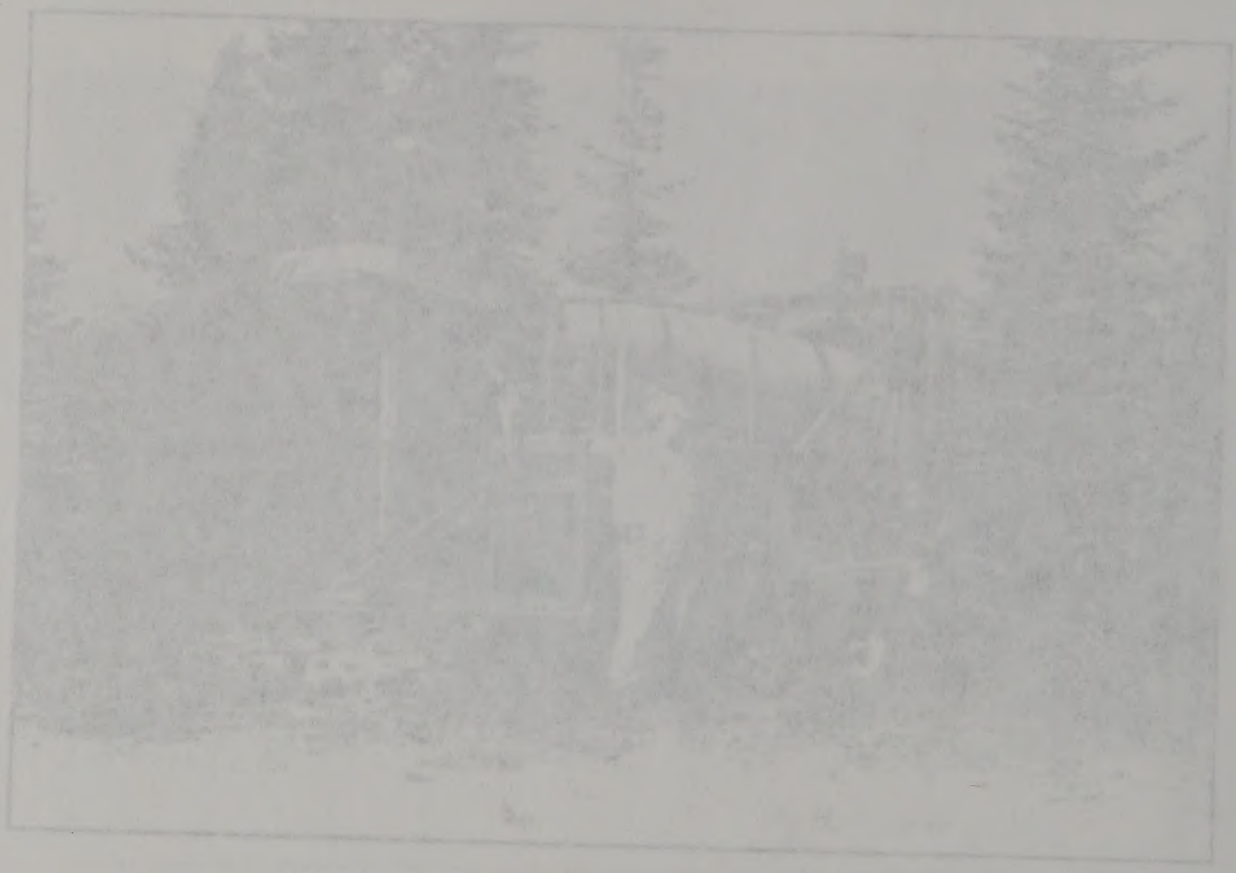


Figure 18.--Trommel at Pioneer patented placer, Kelly-Cayuse study area vicinity, Clearwater County, Idaho



exceeds the 50 gallons per minute reported by Ross (1971) and is probably at least ten times greater; the vigorous flow has created depressions near the springs. The water has a faint, sulfurous odor and is effervescent.

Temperature and flow rates at Weir Creek and Colgate thermal areas are high enough for direct use for domestic heating. Geothermal development would increase the rate of energy production. Thermal resources are not classified for this report because geothermal reservoir information is lacking.

Analyses of samples from near Weir Creek Hot Springs and Colgate Warm Springs do not show any geochemical signature unique to geothermal activity in the study area. Economic deposition of metals is not known to have occurred near the thermal springs, although an alluvial-sample concentrate (IKM394P) from Burnt Cedar Creek contained uneconomic gold, 165 ppb.

The Bungalow pluton, also a granite of Tertiary age, is not known to host thermal springs. However, shallow groundwater temperatures of 58 ° and 61 °F in the Bungalow pluton several mi northwest of the study area were measured in a region dominated by temperatures between 40 ° and 55 °F (Goff, 1980). Temperatures of groundwater in the Bungalow pluton adjacent to the study area are not of economic interest.

In spite of its name, Warm Creek, a tributary of Hemlock Creek, flowed at 53 °F, within a few degrees of the same cool temperatures of neighboring tributaries to Hemlock Creek.

Nonmetallic Mineral Localities

Whole-rock analyses indicate that quartz and quartzite from the study area contain too much iron for use as high-purity silica. Seven samples (IKM008, IKM009, IKM027, IKM054, IKM080, IKM108, IKM205) of quartz and quartzite from various sites in the north part of the study area contained impurities (Sterrett, 1958) and are far from markets. Likewise, the small outcrops of impure dolomitic marble at Blacklead Mountain are too low grade to be of economic interest.

Stone and sand and gravel will continue to be mined for local use, mainly for road construction. Large-scale mining of stone and sand and gravel for markets away from the study area are unlikely because of the high cost of transporting these bulky commodities. Recovery of gold and other heavy minerals should be considered for any large gravel mine here.

CONCLUSIONS

Mineral resources were delineated at three localities. One of these is a lode (Driessel prospect) and two are placers (Moose Creek and North Fork Clearwater River); none are economic because of low grade. In addition, anomalous sample analyses were obtained at eight localities: along Hanson Ridge; near the Snowbird mine; at Lunde and Toboggan Ridges; south of Pot Mountain; in the Rhodes Peak graben vicinity; south of Hoodoo Pass; in the Moose City vicinity; and in the Weitas area. Prospecting is particularly warranted at four of these areas: the Hanson Ridge structure, Snowbird mine, Moose City, and the Rhodes Peak graben, especially near Shale Mountain.

Adjacent sites in the Kelly-Cayuse study area contain diverse suites of anomalous elements. Differences in depositional chemistry, sources, and host rocks affected concentrations of trace and economic minerals. Some broad trends exist and are probably related to intrinsic differences in host rock lithologies and to small veins and disseminations. Concentrations of base metals, while not economic, may be great enough to hinder recovery of gold by leaching.

Enough gold-bearing gravel exists near Moose City and along North Fork Clearwater River to support small-scale, suction-dredge mining indefinitely, but large-scale placer gold mining would be marginal. Suction dredging would not be as favorable along other creeks where gold was found, such as Weitas and Cayuse Creeks and their tributaries. Restrictive laws and permitting may preclude mining along any of the streams.

Geothermal energy resources at Weir Creek Hot Springs and Colgate Warm Springs have no nearby markets and have not been adequately explored to quantify resources. Indicators of epithermal gold mineralization do not exist or are weak in the vicinity of the thermal springs and the Horseshoe Lake stock.

Nonmetallic mineral resources, mainly stone and sand and gravel, will not be produced in quantity within the foreseeable future because of transportation expenses.

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Table A-1.--Descriptions of rock samples from the Kelly-Cayuse study area vicinity, Shoshone, Clearwater, and Idaho Counties, Idaho; and Mineral and Missoula Counties, Montana

Number	Type	Size (ft)	Description
IKM002	Random Chip	NA	Limonitic, pyritic biotite gneiss, granodiorite and simple pegmatite. Foliation strikes N. 10° W. and dips 62° NE.
IKM003	Chip	10.0	Simple pegmatite lense at locality of sample IKM002; about 40 percent quartz and 60 percent feldspar, with traces of pyrite.
IKM004	Chip	5.25	Arsenopyrite- and pyrite-rich (30 percent), limonitic, quartzose lens in sheared biotite gneiss. Strikes N. 65° W. with 45° SW. dip, but contorted.
IKM008	Chip	5.0	White, friable, medium-grained, massive quartzite with estimated 2 percent mica; also pegmatite dikes and schistose zones.
IKM009	Select	NA	White, friable quartzite.
IKM012	Chip	4.5	Limonitic, orange to brown, decomposed, medium-grained quartzite.
IKM013	Grab	NA	Limonitic, intensely fractured quartz vein.
IKM014	Chip	10.0	Limonitic, yellow-brown mica schist with schistosity trending N. 60° W. and dipping 30° SW.
IKM015	Chip	3.5	Limonite-stained, intensely fractured, massive quartz vein striking N. 70° E. and dipping 70° SE.
IKM016	Grab	NA	Limonitic, vuggy, massive quartz with a few specular hematite flakes as large as two in. across.
IKM020	Chip	1.3	Coarse-grained, simple pegmatite with biotite, plagioclase, and quartz. Strikes E. and dips 53° S.
IKM021	Chip	4.0	Gray, limonitic, fine-grained mica schist with a thin pegmatite stringer.
IKM022	Grab	NA	Limonite-stained, vuggy quartz float.
IKM023	Chip	5.1	Gray, friable, fine-grained, intensely fractured quartzite.
IKM027	Grab	NA	White, friable quartzite with minor limonite. Two small pits, probably stump holes.

Table A-1.--Descriptions of rock samples from the Kelly-Cayuse study area vicinity, Shoshone, Clearwater, and Idaho Counties, Idaho; and Mineral and Missoula Counties, Montana--Continued

Number	Type	Size (ft)	Description
IKM028	Grab	NA	Porphyritic, fine- to medium-grained basalt sill with minor limonite; sheet-jointed on top. Strikes N. 10° E. and dips 35° SE.
IKM030	Chip	0.5	Limonite- and manganese oxide-stained, vuggy, white quartz vein with gray to limonitic schist below. Strikes N. 30° W. and dips 38° NE.
IKM031	Chip	0.5	Black, porphyritic lamprophyre dike above and parallel to quartz vein of sample locality IKM030.
IKM032	Chip	0.3	Limonite- and clay-rich mica schist in hangingwall above sample locality IKM031.
IKM036	Grab	NA	Vein quartz as thick as 2 ft with limonitic, vuggy casts of tabular, bladed mineral to 2 in. Pegmatitic feldspar and mica. Caved shaft is about 7 ft deep.
IKM047	Grab	NA	Brecciated, vuggy, limonitic, quartzose zone at least 10 ft thick in granitic rock.
IKM048	Grab	NA	Limonitic, intensely fractured, argillized, sericitic granitic rock.
IKM049	Grab	NA	Limonitic, silicified, argillized, brecciated, sheared granitic rock.
IKM050	Chip	8.0	Quartzose, limonitic, sheared, brecciated granitic rock. Some chalcedonic silica with fine-grained gray sulfides.
IKM051	Grab	NA	Sheared, micaceous, pegmatite vein in mica schist. Limonitic and red-stained. At least 50 ft across.
IKM052	Grab	NA	White, massive, quartz-vein float with tabular tourmaline(?) crystals to 1/2 in.
IKM053	Grab	NA	White, massive quartz with some limonite and red stain. Lens at least 5 ft thick in mica schist.
IKM054	Random Chip	NA	Nearly white, medium-grained, massive, nearly horizontal quartzite with almost no limonite stain.

Table A-1.--Descriptions of rock samples from the Kelly-Cayuse study area vicinity, Shoshone, Clearwater, and Idaho Counties, Idaho; and Mineral and Missoula Counties, Montana--Continued

Number	Type	Size (ft)	Description
IKM055	Random Chip	NA	Brecciated, vuggy, limonitic, brown siltite in float, probably from outcrops along ridge crest.
IKM056	Random Chip	NA	Brecciated, sheared, limonitic carbonate zone in metasediments. Contorted but generally southwest dipping.
IKM067	Grab	NA	Gray, fine-grained quartzite with biotite schist and minor limonite and pegmatite veinlets.
IKM076	Chip	11.9	Limonitic, fine-grained, porphyritic rhyolite dike; gray porphyritic volcanic rock to south, granitic rock to north. Strikes N. 30° E., dips 75° NW.
IKM080	Grab	NA	White, massive quartz lens in calc-silicate rock. At least 20 ft thick.
IKM083	Chip	0.75	Gray, fine-grained, carbonate-rich siltite with heavy limonite stain. Strikes N. 20° W. and dips 75° NE.
IKM085	Chip	1.0	Gray, calcareous siltite with heavy limonite stain. Strikes north and dips 74° E.
IKM094	Grab	NA	Gray, silty, clay-rich, gougey material from avalanche chute.
IKM097	Grab	NA	Black mica schist from sheared, amphibolitic mafic dike in granitic rock at small quarry about 150 ft long and 30 ft wide.
IKM101	Grab	NA	Massive, white quartz vein with limonite along shear planes and in voids. Biotitic quartzite country rock. Vein strikes N. 45° W., dips 67° NE.
IKM102	Grab	NA	Red, angular, brecciated quartzite with estimated 25 percent, fine-grained, limonitic, silicic matrix. Porphyritic volcanic rocks above, quartzite below.
IKM103	Random Chip	NA	Brecciated, limonitic, hydrothermally bleached quartzite. Strikes N. 70° W. and dips near vertical. Low- and high-angle slickensides.

Table A-1.--Descriptions of rock samples from the Kelly-Cayuse study area vicinity, Shoshone, Clearwater, and Idaho Counties, Idaho; and Mineral and Missoula Counties, Montana--Continued

Number	Type	Size (ft)	Description
IKM104	Random Chip	NA	Limonitic, brecciated, bleached, purple quartzite cemented by matrix composed partly of porphyritic volcanic rock.
IKM105	Grab	NA	Gray, brecciated quartzite in about 50 percent silicic, porphyritic, andesitic rock matrix.
IKM106	Grab	NA	Black-veined, limonitic granitic rock in area of gray granodiorite.
IKM107	Random Chip	NA	Limonitic, actinolitic, epidote- and diopside-bearing, carbonate-rich, medium-grained calc-silicate rock in area of gray granodiorite.
IKM108	Grab	NA	White, massive, pegmatitic quartz.
IKM109	Grab	NA	Black and brassy, tabular and rounded gersdorffite in fluorite and calcite vein.
IKM110	Grab	NA	Limonitic, massive, medium-grained, ankeritic(?) breccia filling.
IKM111	Grab	NA	Green-stained, fluoritic, limonitic, ankeritic(?) breccia filling in quartz-carbonate vein.
IKM112	Grab	NA	Dark-purple, friable, intensely fractured fluorite in coarse-grained vein.
IKM113	Grab	NA	White to pale-brown, coarse-grained, massive carbonate.
IKM114	Grab	NA	Nearly colorless, blue to green, massive, fractured fluorite.
IKM115	Grab	NA	Parisite; wedge-terminated, dense, tabular to pencil-like, waxy, brown crystals to 1/2 in. wide by 2 in. long.
IKM116	Grab	NA	Quartz vein about 3 in. thick with about 30 percent pyrite; bleached gray quartzite around quartz vein. Sample from float.
IKM117	Grab	NA	Blue-gray, massive to coarsely crystalline, milky quartz.
IKM118	Chip	0.75	Limonitic, argillic, intensely fractured, calcareous quartzite.
IKM119	Grab	NA	Gray quartzite with limonite stains and scapolite blebs. Strikes N. 20° W. and dips 52° NE.

Table A-1.--Descriptions of rock samples from the Kelly-Cayuse study area vicinity, Shoshone, Clearwater, and Idaho Counties, Idaho; and Mineral and Missoula Counties, Montana--Continued

Number	Type	Size (ft)	Description
IKM120	Grab	NA	Limonitic, silicic, argillic, brecciated calc-silicate rock.
IKM121	Chip	24.0	Limonitic, argillic, silicic, sheared, brecciated calc-silicate rock.
IKM122	Chip	3.0	Limonitic, brecciated, silicic, argillic, fine- to medium-grained, partly sheared calc-silicate rock west of quartz lens at sample locality IKM123.
IKM123	Chip	20.0	Limonitic (weak), vuggy, massive, white quartz lens about 20 ft thick and 200 ft long. Strikes N. 50° W. and dips 80° SW.
IKM124	Chip	2.6	Limonitic, fine- to medium-grained, brecciated, contorted, sheared calc-silicate rock at east side of quartz vein at sample locality IKM123.
IKM125	Grab	NA	Brecciated, limonitic calc-silicate rock with massive white quartz in zone about 20 ft wide and 200 ft long trending N. 50° W.
IKM126	Grab	NA	Limonitic, limy, calc-silicate rock with pyrite and calcite (?) molds.
IKM127	Chip	2.2	Limonitic, laminar quartzite striking N. and dipping 30° E.
IKM128	Grab	NA	Limonitic, silicic, sheared, argillic calc-silicate breccia.
IKM129	Random Chip	NA	Quartzose, silicified, limy, limonitic, sheared and brecciated calc-silicate rock.
IKM144	Random Chip	NA	Limonitic, sheared, calcareous siltite (breccia of the Wallace Formation). Strikes N. 5° E. and is near vertical.
IKM146	Grab	NA	Limonitic, quartz-veined siltite (Wallace Formation) and a few pieces of quartz, some with rhombohedral casts. Short caved adit.
IKM147	Select	NA	Limonitic, recrystallized quartzite with quartz veins.
IKM149	Chip	1.0	Gray, yellow-green, silicified, quartz-veined calc-silicate rock, biotite schist, pegmatite veins, and diorite.

Table A-1.--Descriptions of rock samples from the Kelly-Cayuse study area vicinity, Shoshone, Clearwater, and Idaho Counties, Idaho; and Mineral and Missoula Counties, Montana--Continued

Number	Type	Size (ft)	Description
IKM150	Chip	0.5	Quartz-veined, limonitic calc-silicate breccia.
IKM165	Grab	NA	Limonitic, vuggy, sheared calc-silicate and granitic rocks at pit about 10 by 15 by 5 ft.
IKM166	Random Chip	NA	Limonitic, vuggy, porphyritic gray rhyolite dike with estimated 1 percent or less pyrite, weathered to limonitic blebs.
IKM169	Grab	NA	Limonitic, granitic and porphyritic gray volcanic rocks with thin quartz veins and black minerals.
IKM171	Grab	NA	Gray granitic rock with minor limonite and shearing.
IKM172	Grab	NA	Limonitic, black-banded, glossy to earthy magnetite from stockpile. Banding trends N. 70° W. and dips 65° NE. Trench is about 15 ft long.
IKM173	Chip	1.5	Gray, fine- to medium-grained marble with bands of magnetite about 0.5 in. apart. Bands strike N. 70° E. and dip 65° NW.
IKM174	Grab	NA	Limonitic, copper oxide-stained, magnetite-rich rock in 1- to 3-ft-thick zone at contact of granitic and porphyritic dike rock with marble. Trench is about 30 ft long and 15 ft wide; a nearby pit is about 15 ft in diameter.
IKM175	Chip	2.8	Gray, massive, banded, fine- to medium-grained marble with magnetite zone about 3 ft thick striking N. 40° W. and dipping 50° NE.
IKM176	Chip	3.2	Limonitic, pyrite-rich lens in gray marble. Lens is 1 to 4 ft thick, strikes N. 80° W., and dips 42° NE.
IKM177	Grab	NA	Gray, medium-grained, massive, fractured marble.
IKM178	Grab	NA	Green to black, medium-grained massive diopside rock in gray marble.
IKM179	Grab	NA	Massive, contorted, black magnetite bands in gray marble are 1 to 4 ft thick, strike northwest, and dip nearly vertical.

Table A-1.--Descriptions of rock samples from the Kelly-Cayuse study area vicinity, Shoshone, Clearwater, and Idaho Counties, Idaho; and Mineral and Missoula Counties, Montana--Continued

Number	Type	Size (ft)	Description
IKM180	Grab	NA	Limonitic, sulfide-rich biotite schist in granodiorite. From stockpile.
IKM181	Grab	NA	Limonitic, pyrite-rich, sheared, quartzite with gossany coatings and masses. Minor specularite. Trench is about 20 by 12 by 6 ft and is adjacent to a caved shaft estimated 50 ft deep.
IKM182	Grab	NA	Gray, fine-grained quartzite with limonite and quartz on fractures.
IKM183	Grab	NA	Limonitic, pyrite-rich, sheared biotite schist and quartzite at pit 6 by 4 by 3 ft.
IKM184	Chip	0.3	Pyrite-rich shear zone with copper carbonates and quartz in biotite schist; strikes N. 60° E. and dips 75° SE. 10-ft-long adit at end of 20-ft-long trench.
IKM185	Chip	0.5	Limonitic, copper carbonate-stained quartz-veined breccia in quartzite; associated with granitic dike and trends N. 55° W., dips 65° SW.
IKM186	Chip	0.2	White, massive quartz lens about 1 ft thick; strikes N. 10° E. and dips 40° SE.
IKM187	Chip	4.2	Shattered, jointed, limonitic biotite schist and quartzite at portal of adit.
IKM188	Random Chip	NA	Gray, limonitic biotite schist and quartzite.
IKM189	Random Chip	NA	do...
IKM190	Chip	1.0	Argillic, talcose, copper carbonate- and limonite-stained quartzite and biotite schist at face of short adit.
IKM193	Grab	NA	Limonitic, fine-grained, pale-brown porphyritic rhyolite.
IKM201	Select	NA	Hematitic quartzite breccia with silicic red-brown cement. Along major fault zone.
IKM202	Random Chip	NA	Rhyolitic dike, very fine grained with green tint. Some brown, iron oxide stain. Bleached to pink. Some large quartzite clasts.

Table A-1.--Descriptions of rock samples from the Kelly-Cayuse study area vicinity, Shoshone, Clearwater, and Idaho Counties, Idaho; and Mineral and Missoula Counties, Montana--Continued

Number	Type	Size (ft)	Description
IKM203	Grab	NA	Gray to brown, limonitic siltstone and shale with limonitic cavities around weathered pyrite(?). Ripple marks common. Dozer cut is about 50 ft long and 10 ft wide.
IKM204	Grab	NA	Gray to brown, limonitic siltstone and shale with limonitic voids after pyrite, and quartz crystals to 1/8 in. along bedding. Dozer cut is about 20 ft long and 10 ft wide.
IKM205	Grab	NA	Clear to white quartz vein with negligible limonite in gray to brown quartzite.
IKM206	Grab	NA	Limonitic, silicified, oxidized zone near quartz vein.
IKM210	Random Chip	NA	White, massive quartz vein with rhombohedral molds of calcite(?) to 3 in. across.
IKM211	Random Chip	NA	Silicified, limonitic breccia, with fragments as large as 1.5 ft, cemented by calc-silicate or silica matrix.
IKM212	Grab	NA	Calc-silicate rock composed of epidote, diopside, garnet, and magnetite(?).
IKM218	Grab	NA	Medium-gray marble with brown bands and talc-coated fractures.
IKM219	Chip	0.5	Talcose, medium-green, very fine grained shear zone at inclined shaft estimated less than 40 ft deep; zone strikes N. 70° W. and dips 44° NE.
IKM220	Chip	7.0	Limonitic, fine-grained magnetite and hematite, partly silicified, in biotite gneiss.
IKM221	Grab	NA	Limonitic, fine-grained magnetite from stockpile. Two small pits nearby.
IKM222	Grab	NA	Limonitic, argillic, medium- to coarse-grained granitic rock with abundant biotite in area of gray granitic rocks. Three shallow cuts.
IKM223	Grab	NA	Pink to green, chloritized, porphyritic dacite or andesite dike. Caved adit is estimated to have 100 ft of workings.
IKM224	Chip	1.5	Blue-green shear zone(?).

Table A-1.--Descriptions of rock samples from the Kelly-Cayuse study area vicinity, Shoshone, Clearwater, and Idaho Counties, Idaho; and Mineral and Missoula Counties, Montana--Continued

Number	Type	Size (ft)	Description
IKM225	Chip	35.0	Blue-gray, argillized, porphyritic andesite or dacite dike.
IKM226	Grab	NA	Gray, porphyritic-dacite or andesite-dike fragments and silty, sandy matrix from dump of old prospect.
IKM227	Select	NA	Limonitic, purple, black-streaked, calcite-veined, sheared dacite or andesite with vuggy weathering.
IKM228	Chip	16.0	Sheared, locally gougey, argillic, chloritized andesite dike.
IKM229	Chip	0.9	Sheared, limonitic, argillic, silicified, calcified, porphyritic dacite or andesite.
IKM230	Random Chip	NA	Limonitic, argillic, porphyritic andesite or dacite; brecciated locally.
IKM231	Random Chip	NA	Chloritized, blue, locally brecciated andesite.
IKM232	Random Chip	NA	Blue-green, chloritized, argillized, brecciated, porphyritic andesite or dacite.
IKM233	Grab	NA	Limonitic, green-stained, vuggy, chalcedonic quartz vein and pegmatite.
IKM234	Grab	NA	Limonitic, green-stained, vuggy, fine-grained, chalcedonic quartz vein and pegmatite.
IKM239	Chip	1.0	Yellow- and black-streaked, limonitic, nearly vertically dipping biotite schist.
IKM240	Grab	NA	Limonitic, pyritic, fine-grained rhyolitic dike in area of syenitic granitic rock and biotite granite.
IKM242	Grab	NA	Yellow- and gray-banded, partly brecciated quartzite and carbonate with some calc-silicate matrix.
IKM248	Grab	NA	Gray-green, slightly sheared, propyllitic, biotitic granodiorite with minor, vuggy limonite.
IKM249	Grab	NA	White quartz float with limonite stain and some gray patches.
IKM250	Grab	NA	Limonitic, argillic, granitic rock; friable, with a few quartz stringers.

Table A-1.--Descriptions of rock samples from the Kelly-Cayuse study area vicinity, Shoshone, Clearwater, and Idaho Counties, Idaho; and Mineral and Missoula Counties, Montana--Continued

Number	Type	Size (ft)	Description
IKM251	Grab	NA	Limonitic, gray, chloritic, epidotized, fine-grained, chalcedonic(?), porphyritic rhyolite with inclusions of quartzite(?).
IKM252	Grab	NA	Limonitic, argillic, friable, granitic grus near granitic dike.
IKM253	Grab	NA	Limonitic, argillic, locally sheared, friable, decomposed granitic rock with sparse quartz lenses.
IKM258	Grab	NA	Gray to green, sheared, chloritic, argillized, talcose(?), porphyritic volcanic rocks.
IKM259	Chip	9.0	Gray, limonitic, argillic, vuggy, brecciated propylitic quartz vein at least 5 ft thick striking N. 50° W. and dipping 40° SW in granitic rock. Trench about 32 ft long and 5 ft wide.
IKM260	Chip	2.0	Quartz and limonitic, argillic, granitic rock near east contact of mineralized zone. Trench about 10 ft long, 5 ft wide, and 2 ft deep.
IKM261	Chip	3.0	Limonitic, argillic, silicified, medium- to coarse-grained granitic rock. Trench about 10 ft long, 5 ft wide, and 2 ft deep.
IKM262	Chip	1.5	Limonitic, argillic, silicified granitic rock. Trench about 15 ft long, 8 ft wide, and 4 ft deep.
IKM263	Grab	NA	Limonitic, argillic, silicified, brecciated, quartz-veined granitic rock on dump of pit. Trench about 10 ft long, 5 ft wide, and 3 ft deep.
IKM264	Grab	NA	Limonitic, argillic, silicifed, brecciated, quartz-veined granitic rock.
IKM265	Random Chip	NA	Gray, medium-grained granodiorite.
IKM266	Grab	NA	Gray, weathered, argillic, medium-grained granodiorite.
IKM272	Grab	NA	Limonitic, silicified, pyritic, epidote-rich, sheared, brecciated calc-silicate rock and quartzite. Caved adit(?) estimated 10 ft long with cut about 6 ft deep and 15 ft wide.

Table A-1.--Descriptions of rock samples from the Kelly-Cayuse study area vicinity, Shoshone, Clearwater, and Idaho Counties, Idaho; and Mineral and Missoula Counties, Montana--Continued

Number	Type	Size (ft)	Description
IKM273	Grab	NA	Silicified, limonitic, brecciated, pyritic zone and quartz vein to about 1 ft thick striking N. 33° W. and dipping 67° NE. in gray siltite.
IKM274	Random Chip	NA	Gray, micaceous, massive quartzite with minor limonite and hematite.
IKM275	Random Chip	NA	Gray, fine- to medium-grained quartzite with minor limonite and hematite; mica on bedding planes.
IKM276	Random Chip	NA	Limonitic, silicified, brecciated gray quartzite with limonite, hematite, and silica in breccia and along fractures and bedding.
IKM277	Random Chip	NA	Gray, massive, fine- to medium-grained quartzite with hematite, limonite, and silica in breccia filling to 2 ft wide. Liesegang-banded.
IKM278	Random Chip	NA	Gray, massive quartzite with limonite and hematite in small blebs and along fractures and bedding planes and in breccia with silica.
IKM279	Random Chip	NA	Gray to yellow, massive, fine- to medium-grained quartzite with limonite and hematite along fractures and bedding planes.
IKM280	Random Chip	NA	Gray, massive, fine- to medium-grained quartzite with minor limonite and hematite.
IKM281	Random Chip	NA	Gray, massive, fine- to medium-grained quartzite with mica and minor limonite along joints and bedding. Bedding strikes N. 80° W. and dips 7° SW.
IKM282	Random Chip	NA	Brecciated, limonitic, hematitic, silicified quartzite.
IKM283	Random Chip	NA	Gray, micaceous, massive quartzite with minor limonite and hematite in silicic breccia and along joints and bedding planes.
IKM293	Chip	1.0	Quartz vein about 1 ft thick with pyrite lenses to 0.1 by 0.5 ft. Vein strikes N. 10° W. and dips 70° SW.
IKM297	Grab	NA	Limonitic, argillic biotite schist with minor cross-shearing.

Table A-1.--Descriptions of rock samples from the Kelly-Cayuse study area vicinity, Shoshone, Clearwater, and Idaho Counties, Idaho; and Mineral and Missoula Counties, Montana--Continued

Number	Type	Size (ft)	Description
IKM298	Random Chip	NA	White, massive quartzite, with a few limonitic vugs, in granitic rock and pegmatite.
IKM307	Random Chip	NA	Fine- to medium-grained epidote-biotite-granite.
IKM342	Random Chip	NA	Gray to pink, massive, coarse-grained granite with minor fractures and limonite stain.
IKM345	Chip	20.0	Yellow, limonitic, gouge-rich, sheared, slickensided granitic rock; shears strike N. 14° W. and dip 86° NE.
IKM346	Grab	NA	Pink, coarse-grained, massive granite.
IKM350	Grab	NA	Limonitic, argillic, silicic granitic rock in zone at least 100 ft wide that trends N. 10° E. and dips 60° NW.
IKM355	Random Chip	NA	Limonitic simple pegmatite near poorly exposed, porphyritic, volcanic dike.
IKM362	Chip	7.0	Massive, white, lenticular, lightly limonitic, pegmatitic quartz vein in gray biotite schist. Vein strikes N. 80° W. and dips 70° NE.
IKM364	Chip	3.0	Limonitic, argillic gneiss and schist.
IKM365	Grab	NA	Limonitic, carbonate-rich, quartzose, sulfide-bearing actinolitic pegmatite float in area of gray schist and gneiss.
IKM367	Grab	NA	Mafic, coarse-grained, hornblende pegmatite in massive, poorly exposed dike that apparently cross-cuts schist and gneiss.
IKM368	Select	NA	Quartz vein with about 3.8 percent antimony in masses of stibnite blades.
IKM369	Select	NA	Quartz-feldspar vein with stibnite; from stockpile.
IKM370	Chip	4.5	Stibnite-bearing, quartz-, feldspar-, and carbonate-rich veins and breccia in gray to green calc-silicate rock. Vein strikes N. 25° W. and dips 65° SW. Adit about 48 ft long.
IKM371	Chip	4.0	Stibnite-bearing, quartz-, feldspar-, and carbonate-rich veins and breccia in gray to green calc-silicate rock. Vein strikes N. 10° E. and dips 10° NW.

Table A-1.--Descriptions of rock samples from the Kelly-Cayuse study area vicinity, Shoshone, Clearwater, and Idaho Counties, Idaho; and Mineral and Missoula Counties, Montana--Continued

Number	Type	Size (ft)	Description
IKM372	Random Chip	NA	Gray to green calc-silicate breccia with rounded quartzite and marble clasts to 1 ft. Actinolitic with minor pyrite and tetrahedrite.
IKM373	Grab	NA	Gray to brown, massive, jointed fine-grained, porphyritic volcanic dike in probable high-angle, sheared contact with calc-silicate rock to east.
IKM374	Grab	NA	Gray to brown, limonitic, sericitic quartzite from poorly exposed cut. Caved trench is about 50 ft long, 10 ft wide, and 1 ft deep.
IKM378	Chip	0.7	White, massive, fractured, limonitic, pegmatitic, quartz lens in gray, limonitic gneiss strikes N. 45° E. and dips 50° SE.
IKM379	Chip	0.5	Limonitic, epidote- and magnetite-bearing, sheared, contorted calc-silicate rock at least 20 ft thick in granitic rock strikes N. 20° E. and dips 80° NW. Adit 7 ft long.
IKM380	Grab	NA	Limonite-, chalcopyrite(?)-, and magnetite-bearing quartz vein in shear zone at contact of quartzose calc-silicate and granitic rocks. Vein strikes N. 50° E. and dips 90°. Adit 25 ft long.
IKM381	Chip	3.0	Chloritic, epidote-bearing, brecciated, pegmatitic zone about 3 ft thick in granodiorite. Zone strikes N. 20° W. and dips 50° NE. Adit or cave about 6 ft deep.
IKM382	Chip	6.0	Limonitic, silicified, quartzose, brecciated, gray, fine-grained porphyritic dike in volcanic rocks. Dike strikes N. 40° E. and is vertical.
IKM383	Grab	NA	Gray granodiorite and gray, porphyritic volcanic rock; minor limonite stains. Pit about 30 ft in diameter and 10 ft deep in talus.
IKM384	Chip	5.5	Limonitic, argillic, pyritic, fractured, brecciated porphyritic volcanic rock. Prominent fracturing strikes N. 80° E. and dips 80° SE. Pit about 10 by 6 by 10 ft.

Table A-1.--Descriptions of rock samples from the Kelly-Cayuse study area vicinity, Shoshone, Clearwater, and Idaho Counties, Idaho; and Mineral and Missoula Counties, Montana--Continued

Number	Type	Size (ft)	Description
IKM385	Chip	1.5	Limonitic, brecciated, argillic porphyritic volcanic rock.
IKM386	Chip	1.6	Limonitic, argillic, brecciated, pyrite-bearing, brecciated porphyritic volcanic rock.
IKM387	Grab	NA	Limonitic, pyrite- and magnetite-bearing, 10- to 20-ft-wide, limy layer in quartzite and calc-silicate rock. Limy layer strikes N. 40° W. and dips 50° SW. Two pits 5 ft across and 4 ft deep.
IKM388	Grab	NA	Limonitic magnetite and marble float with minor pyrite. Trench about 10 ft long, 8 ft wide, and 4 ft deep.
IKM389	Grab	NA	Gray, fine- to medium-grained marble with pyroxene, magnetite, and pyrite. Zone at least 5 ft thick, strikes N. 40° W. and dips 50° SW. Trench 15 ft long, 6 ft wide, and 5 ft deep.
IKM390	Chip	2.0	Limonitic, magnetite-rich, pyritic zone between marble and pegmatitic granitic rock. Minor epidote, garnet, and chlorite. Trench about 8 ft long , 5 ft wide, and 5 ft deep.
IKM391	Grab	NA	Tactite containing magnetite, epidote, garnet, pyrite, and pyroxene in marble, quartzite, and calc-silicate rock. Caved adit estimated 30 ft long with 30-ft-long trench.
IKM396	Chip	0.5	Limonitic, earthy, friable alluvial fan argillized by Colgate Warm Springs.
IKM398	Grab	NA	Gray, green, and yellow, argillic, slightly limonitic, faulted, brecciated granitic rock, pegmatite, and porphyritic volcanic rock.
IKM399	Chip	0.4	Limonitic, manganese oxide-stained, vuggy, chalcedony-veined shear zone in limonitic granitic rock. Shear zone strikes N. 10° E. and dips 60° NW.
IKM404	Chip	1.0	Argillized, silicified, bleached, earthy granitic rock in shear zone at least 200 ft wide.
IKM405	Chip	1.5	Gray, argillized, limonitic, friable granitic rock in fracture zone at least 20 ft wide.

Table A-1.--Descriptions of rock samples from the Kelly-Cayuse study area vicinity, Shoshone, Clearwater, and Idaho Counties, Idaho; and Mineral and Missoula Counties, Montana--Continued

Number	Type	Size (ft)	Description
IKM406	Grab	NA	Limonitic, coarse-grained, porphyritic granitic rock in zone at least 50 ft wide.
IKM408	Random Chip	NA	Gray, coarse-grained simple pegmatite in gray, porphyritic (phenocrysts 0.1 to 0.2 ft) granite with minor garnets.
IKM409	Grab	NA	White, gray, and blue, massive, fractured quartz with associated simple pegmatite.
IKM415	Chip	3.0	Gray, limonitic, argillic, gouge-rich shear zone more than 5 ft thick, with simple pegmatite in argillized granitic rock. Zone strikes N. 25° W. and dips 55° SW.
IKM417	Grab	NA	Limonitic, argillic, sheared, vuggy quartz vein 1.5 to 2 ft thick in boulder. Cockscomb quartz crystals to 0.1 ft.
IKM419	Grab	NA	Gray, argillic, granitic grus.
IKM421	Grab	NA	White, massive quartz float.
IKM426	Grab	NA	White, massive, fractured quartz vein with minor limonite in intensely weathered granitic rock.
IKM427	Grab	NA	White, fractured pegmatitic quartz with limonite in zone about 6 ft thick in gray schist and gneiss.
IKM428	Chip	0.75	White, massive, vuggy, fractured quartz, with about 5 percent pyrite cubes and blebs, in gray granitic rock. Pit about 5 ft across and 3 ft deep.
IKM429	Grab	NA	Quartz-feldspar-biotite pegmatite, poorly exposed. Dozer scrape about 100 ft long, 50 ft wide, and 3 ft deep.
IKM432	Grab	NA	White, fractured quartz with minor limonite in vicinity of pegmatite, gneiss, schist, and granitic rock.
IKM433	Grab	NA	White to faintly limonitic, banded to massive, medium- to coarse-grained, partly vuggy quartzite.
IKM435	Grab	NA	White, sparsely limonitic, argillic, bleached, medium-grained, massive granitic rock with pegmatite stringers.

Table A-1.--Descriptions of rock samples from the Kelly-Cayuse study area vicinity, Shoshone, Clearwater, and Idaho Counties, Idaho; and Mineral and Missoula Counties, Montana--Continued

Number	Type	Size (ft)	Description
IKM436	Chip	2.0	Limonitic, argillic, pegmatitic, sheared, gouge-rich zone at least 20 ft thick in biotite schist and gneiss. Zone strikes N. 80° E. and dips 75° SE.
IKM452	Grab	NA	Gray, brown-weathering, fine-grained, massive basalt with about 5 percent round vesicles to about 1/8 in.
IKM470	Chip	1.5	Gray biotite quartzite with 0.1-ft-thick and 2-ft-long quartz lens, with pyrite lens on east side.
IKM477	Chip	4.0	Gray to green, sheared migmatite of calc-silicate and granitic rocks containing chlorite, epidote, and minor pyrite blebs. Foliation strikes N. 30° E and dips vertically.
IKM478	Chip	18.0	Limonitic, gray to green, massive, fractured calc-silicate breccia of the Wallace formation.
IKM479	Grab	NA	Gray to green, massive, fine- to medium-grained, actinolitic, biotitic calc-silicate breccia with minor pyrite, quartz, and chlorite. Caved adit with about 500 ft of workings.
IKM480	Grab	NA	Gray, fine-grained lamprophyre with anorthoclase phenocrysts to 0.1 ft.
IKM481	Chip	2.7	Brown, argillic calc-silicate rock with heavy black soil overburden.
IKM482	Grab	NA	White, massive, vuggy quartz vein as thick as 1 ft with stibnite and tetrahedrite(?); from stockpile of pit. Shallow pit about 75 ft long and 50 ft wide.
IKM483	Grab	NA	Brown to gray, argillic, limonitic, massive, porphyritic rhyolite.
IKM484	Chip	2.5	Quartz-veined, limonitic calc-silicate breccia.
IKM485	Chip	6.0	Limonitic, argillic calc-silicate breccia.
IKM486	Grab	NA	Green, actinolitic, limonitic calc-silicate breccia.
IKM487	Grab	NA	White, massive, slightly limonitic vein quartz as thick as 1 ft with weathered, angular inclusions to 0.1 ft.

Table A-1.--Descriptions of rock samples from the Kelly-Cayuse study area vicinity, Shoshone, Clearwater, and Idaho Counties, Idaho; and Mineral and Missoula Counties, Montana--Continued

Number	Type	Size (ft)	Description
IKM488	Grab	NA	Limonitic, green, actinolite-bearing calc-silicate breccia.
IKM490	Grab	NA	Gray to green, partly limonitic, actinolitic calc-silicate breccia with a few narrow quartz veins and minor pyrite and tetrahedrite(?).
IKM491	Grab	NA	White, massive, vuggy, slightly limonitic, tetrahedrite-bearing quartz vein fragments as wide as 2 ft in float.
IKM492	Random Chip	NA	Gray to green, fine-grained, brecciated, porphyritic volcanic rock with minor limonite, especially along fractures.
IKM493	Chip	0.5	Limonitic, manganese oxide-stained, vuggy, poorly exposed quartz vein.
IKM494	Grab	NA	Limonitic, brown to green, brecciated, sandy, tuffaceous, porphyritic volcanic rocks.
IKM495	Grab	NA	White, massive, vuggy, quartz float fragments as much as 0.5 ft across; minor limonite.
IKM496	Grab	NA	White, massive, vuggy, quartz boulder about 5 ft across with minor limonite, chlorite, and actinolite.
IKM497	Grab	NA	Gray, decomposed, argillic, sparsely limonitic, biotitic, porphyritic volcanic rock.
IKM498	Chip	4.0	Massive white quartz with minor limonite.
IKM499	Grab	NA	Limonitic, vuggy, pegmatitic quartz float.
IKM502	Chip	1.0	Gray, micaceous quartzite; minor limonite, and green stains. Quartzite strikes E. and dips 50° N.; surrounded by gray mica schist, cut by pegmatite.
IKM503	Chip	1.25	Limonitic, manganiferous, argillic, nontronitic, sheared, granitic rock striking N. 50° W. and dipping 80° SE.
IKM504	Grab	NA	Yellow, silicified, rhyolitic breccia with rounded quartzite fragments.

Table A-2.--Analyses of rock samples from the Kelly-Cayuse study area vicinity, Shoshone, Clearwater, and Idaho Counties, Idaho; and Mineral and Missoula Counties, Montana

[ppb, part per billion; ppm, part per million; %, percent; <, less than; underlining denotes anomalous analyses, threshold shown beneath element symbols; latitudes and longitudes use 1927 North American Datum]

Sample Number	Latitude	Longitude	Au (474) (ppb)	Ag (17) (ppm)	Cu (634) (ppm)	Pb (265) (ppm)	Zn (599) (ppm)	As (502) (ppm)	Sb (98) (ppm)	W (17) (ppm)	Mn (4289) (ppm)	Ba (154) (ppm)	Mo (24) (ppm)	Hg (1008) (ppb)
IKM002	46.7144	115.1847	8	<0.2	20	6	71	<5	<5	<10	252	205	3	10
IKM003	46.7144	115.1847	<5	<0.2	6	7	5	<5	<5	<10	30	<100	10	<10
IKM004	46.7144	115.1847	<5	1.3	4750	10	12	<5	<5	<10	40	<100	3	<10
IKM008	46.7331	115.0767	258	<0.2	2	4	3	<5	<5	<10	21	<100	2	15
IKM009	46.7331	115.0767	8	<0.2	1	5	2	<5	<5	<10	16	<100	2	20
IKM012	46.7797	115.1308	<5	<0.2	4	7	7	<5	<5	<10	28	<100	4	<10
IKM013	46.7753	115.1339	15	<0.2	2	8	3	<5	<5	<10	20	<100	2	10
IKM014	46.7753	115.1339	<5	<0.2	50	12	49	<5	<5	<10	32	135	2	15
IKM015	46.7753	115.1339	535	0.2	12	12	8	6	<5	<10	62	<100	3	65
IKM016	46.7794	115.1408	5	<0.2	11	5	4	<5	<5	<10	33	<100	5	10
IKM020	46.7803	115.1339	12	<0.2	2	15	4	<5	<5	<10	20	<100	2	10
IKM021	46.7803	115.1339	67	<0.2	2	12	9	<5	<5	<10	52	<100	2	15
IKM022	46.7803	115.1339	185	5.3	22	10	6	<5	<5	<10	34	<100	6	10
IKM023	46.7803	115.1339	12	<0.2	3	17	4	<5	<5	<10	10	<100	2	<10
IKM027	46.7269	115.0792	<5	<0.2	45	24	5	<5	<5	<10	25	<100	3	<10
IKM028	46.7472	115.0717	<5	<0.2	41	5	15	<5	<5	<10	30	<100	2	<10
IKM030	46.7939	115.1072	<5	<0.2	4	4	5	<5	<5	<10	510	185	1	10
IKM031	46.7939	115.1072	10	2.7	23	4	142	<5	<5	<10	9350	3650	8	80
IKM032	46.7939	115.1072	5	0.5	8	<2	66	<5	<5	<10	3.0%	1015	15	85
IKM036	46.7619	115.0300	<5	0.7	8	110	33	<5	<5	<10	110	<100	3	15
IKM047	46.7050	114.8944	2815	8.4	10	12	6	3560	98	<10	37	<100	15	4250
IKM048	46.7050	114.8944	4970	7.6	4	11	10	5020	7	<10	24	110	5	5360
IKM049	46.7050	114.8944	3460	4.9	4	37	22	1015	10	<10	50	<100	18	680
IKM050	46.7050	114.8944	2600	7.3	2	16	3	3450	80	<10	35	<100	25	2370
IKM051	46.7769	115.1800	15	<0.2	22	5	2	35	<5	<10	30	<100	2	<10
IKM052	46.7783	115.1822	<5	<0.2	4	3	7	25	<5	<10	54	<100	1	10
IKM053	46.7956	115.1653	<5	<0.2	3	2	1	13	<5	<10	37	<100	6	10
IKM054	46.7439	114.8464	<5	<0.2	2	2	4	10	<5	<10	25	<100	1	<10
IKM055	46.7447	114.8456	<5	<0.2	3	5	9	6	<5	<10	250	<100	6	<10
IKM056	46.7739	114.8422	<5	<0.2	2	<2	3	<5	<5	<10	405	<100	4	<10
IKM067	46.7700	115.0967	<5	<0.2	3	2	2	5	<5	<10	16	<100	5	<10
IKM076	46.6525	114.8508	<5	<0.2	10	21	22	<5	<5	<10	98	<100	4	10
IKM080	46.7211	114.8639	<5	<0.2	3	3	1	<5	<5	<10	31	<100	1	<10

TABLE A-2.--Analyses of rock samples--Continued

Sample Number	Latitude	Longitude	Au (474) (ppb)	Ag (17) (ppm)	Cu (634) (ppm)	Pb (265) (ppm)	Zn (599) (ppm)	As (502) (ppm)	Sb (98) (ppm)	W (17) (ppm)	Mn (4289) (ppm)	Ba (154) (ppm)	Mo (24) (ppm)	Hg (1008) (ppb)
IKM083	46.9750	115.0247	<5	<0.2	28	2	58	<5	<5	<10	70	100	2	20
IKM085	46.9531	115.0161	<5	<0.2	5	43	34	<5	<5	<10	95	<100	3	20
IKM094	46.7451	115.2397	<5	<0.2	14	3	42	<5	<5	<10	38	<100	3	10
IKM097	46.7200	115.1253	<5	<0.2	30	<2	232	<5	<5	<10	105	775	4	20
IKM101	46.7783	115.1481	<5	<0.2	3	4	3	<5	<5	<10	43	<100	2	<10
IKM102	46.7194	114.8081	<5	<0.2	4	5	5	<5	<5	<10	58	<100	1	<10
IKM103	46.7214	114.8103	602	<0.2	3	3	5	<5	<5	<10	40	<100	2	<10
IKM104	46.7222	114.8075	<5	<0.2	2	8	8	<5	<5	<10	85	<100	1	<10
IKM105	46.7219	114.8025	<5	<0.2	10	16	24	8	<5	<10	122	<100	2	<10
IKM106	46.7564	114.9033	20	<0.2	6	6	9	110	<5	<10	62	<100	2	<10
IKM107	46.7603	114.9125	10	<0.2	2	4	2	13	<5	<10	45	<100	3	<10
IKM108	46.7786	114.7931	<5	<0.2	2	3	3	9	<5	<10	22	<100	2	<10
IKM109	46.7786	114.7931	<5	<0.2	8	<2	3	170	<5	<10	142	<100	6	10
IKM110	46.7786	114.7931	<5	<0.2	3	<2	2	<5	<5	<10	580	<100	5	<10
IKM111	46.7786	114.7931	<5	<0.2	2	<2	2	50	<5	<10	15	<100	6	<10
IKM112	46.7786	114.7931	<5	<0.2	2	<2	1	<5	<5	<10	3	<100	5	<10
IKM113	46.7786	114.7931	<5	<0.2	4	<2	1	<5	<5	<10	120	<100	6	<10
IKM114	46.7786	114.7931	<5	<0.2	12	<2	2	16	<5	<10	4	<100	5	<10
IKM115	46.7786	114.7931	<5	<0.2	12	35	3	7.5%	27	<10	15	<100	5	890
IKM116	46.7786	114.7931	<5	<0.2	2	6	2	560	<5	<10	30	<100	2	10
IKM117	46.7786	114.7931	<5	<0.2	2	3	2	290	<5	<10	32	<100	4	<10
IKM118	46.7772	114.7922	<5	<0.2	16	2	3	175	<5	<10	28	<100	2	<10
IKM119	46.7778	114.7886	<5	<0.2	7	<2	5	138	<5	<10	60	<100	6	<10
IKM120	46.7811	114.8119	<5	<0.2	2	4	3	125	<5	<10	166	<100	3	<10
IKM121	46.7808	114.8131	<5	<0.2	2	2	2	81	<5	<10	192	<100	2	<10
IKM122	46.7811	114.8131	<5	<0.2	2	2	1	72	<5	<10	80	<100	1	<10
IKM123	46.7811	114.8131	<5	<0.2	3	6	1	93	<5	<10	28	<100	2	<10
IKM124	46.7811	114.8131	<5	<0.2	2	<2	2	65	<5	<10	107	<100	3	<10
IKM125	46.7789	114.8203	10	<0.2	2	3	3	40	<5	<10	78	<100	2	<10
IKM126	46.7789	114.8203	<5	<0.2	6	3	3	38	<5	<10	32	<100	2	<10
IKM127	46.7819	114.8292	<5	<0.2	12	3	3	35	<5	<10	70	<100	5	<10
IKM128	46.7833	114.8292	5	<0.2	3	<2	5	33	<5	<10	325	<100	2	<10
IKM129	46.7611	114.7697	12	<0.2	6	2	4	36	<5	<10	168	<100	2	<10
IKM144	46.8081	114.9000	<5	<0.2	17	4	12	18	<5	<10	322	<100	2	<10
IKM146	46.7922	114.8886	<5	<0.2	2	3	3	31	<5	<10	138	<100	4	<10
IKM147	46.7922	114.8886	<5	<0.2	2	2	2	18	<5	<10	40	<100	1	<10
IKM149	46.7503	114.9958	<5	<0.2	1	5	1	15	<5	<10	38	<100	1	<10
IKM150	46.7514	114.9950	8	<0.2	2	3	2	22	<5	<10	94	<100	4	<10
IKM165	46.5972	114.8539	<5	<0.2	3	3	6	15	<5	<10	60	<100	1	<10

TABLE A-2.--Analyses of rock samples--Continued

Sample Number	Latitude	Longitude	Au (474) (ppb)	Ag (17) (ppm)	Cu (634) (ppm)	Pb (265) (ppm)	Zn (599) (ppm)	As (502) (ppm)	Sb (98) (ppm)	W (17) (ppm)	Mn (4289) (ppm)	Ba (154) (ppm)	Mo (24) (ppm)	Hg (1008) (ppb)
IKM166	46.6019	114.8522	<5	<0.2	7	12	14	18	<5	<10	29	<100	2	<10
IKM169	46.6356	114.8583	35	<0.2	15	24	53	6	<5	<10	250	<100	4	<10
IKM171	46.6394	114.8522	<5	<0.2	2	7	32	8	<5	<10	260	<100	3	<10
IKM172	46.6472	114.8436	75	0.2	725	<2	190	170	<5	<10	4.0%	<100	14	50
IKM173	46.6472	114.8436	20	0.2	285	<2	18	30	<5	<10	6200	<100	10	10
IKM174	46.6469	114.8417	265	37.0	1.1%	24	230	1.5%	<5	<10	2360	<100	55	265
IKM175	46.6472	114.8400	58	5.2	8360	<2	110	108	<5	<10	2950	<100	7	80
IKM176	46.6475	114.8403	23	3.1	6570	3	51	195	<5	<10	8500	<100	70	55
IKM177	46.6475	114.8453	<5	<0.2	125	<2	6	33	<5	<10	610	<100	6	125
IKM178	46.6472	114.8456	<5	<0.2	58	2	49	35	<5	<10	465	195	3	10
IKM179	46.6469	114.8458	8	0.2	113	<2	362	102	<5	<10	3.2%	<100	4	135
IKM180	46.6347	114.8392	570	2.0	230	32	10	100	<5	<10	118	<100	52	225
IKM181	46.6342	114.8381	3725	18.0	7220	23	58	12	<5	<10	314	<100	48	305
IKM182	46.6342	114.8378	57	0.4	345	3	52	15	<5	<10	490	<100	6	10
IKM183	46.6339	114.8369	65	0.6	320	8	31	37	<5	<10	292	<100	60	50
IKM184	46.6347	114.8361	10	260.0	4.2%	710	178	<5	<5	<10	1185	<100	45	980
IKM185	46.6347	114.8361	5	50.0	5.0%	305	310	<5	<5	<10	2010	<100	35	30
IKM186	46.6347	114.8361	<5	1.4	685	9	7	17	<5	<10	83	<100	6	20
IKM187	46.6347	114.8361	<5	15.0	480	19	112	20	<5	<10	1780	<100	10	95
IKM188	46.6347	114.8361	<5	2.5	168	14	69	15	<5	<10	450	<100	7	15
IKM189	46.6347	114.8361	<5	1.7	230	51	97	15	<5	<10	655	<100	5	40
IKM190	46.6347	114.8361	7	16.0	2805	82	110	10	<5	<10	815	<100	190	145
IKM193	46.6475	114.8619	<5	0.2	14	14	10	27	<5	<10	330	<100	4	25
IKM201	46.7208	114.8114	58	<0.2	7	12	16	15	<5	<10	52	<100	3	<10
IKM202	46.7219	114.8075	<5	<0.2	20	18	17	5	<5	<10	110	<100	2	<10
IKM203	46.7800	114.8056	<5	<0.2	2	3	3	<5	<5	<10	26	<100	2	<10
IKM204	46.7814	114.8061	<5	<0.2	5	4	3	13	<5	<10	14	<100	3	<10
IKM205	46.7817	114.8106	<5	<0.2	2	3	6	5	<5	<10	40	<100	1	<10
IKM206	46.7814	114.8122	<5	<0.2	3	3	6	9	<5	<10	232	<100	3	<10
IKM210	46.7989	114.8897	<5	<0.2	2	4	3	<5	<5	<10	20	<100	4	<10
IKM211	46.7989	114.8897	<5	<0.2	4	4	4	18	<5	<10	286	<100	2	<10
IKM212	46.7608	114.9133	<5	<0.2	3	8	3	5	<5	<10	45	<100	2	<10
IKM218	46.6475	114.8425	<5	<0.2	70	14	121	28	<5	<10	675	100	18	20
IKM219	46.6475	114.8425	<5	0.5	50	67	185	15	<5	<10	1560	250	8	15
IKM220	46.6433	114.8325	20	1.4	103	42	168	11	<5	<10	1.3%	390	22	70
IKM221	46.6433	114.8325	295	0.4	82	19	165	40	<5	<10	2.7%	<100	4	<10
IKM222	46.6447	114.9064	5	<0.2	12	18	44	23	<5	<10	415	<100	10	<10
IKM223	46.6425	114.8361	<5	<0.2	30	15	102	10	<5	<10	322	<100	6	<10
IKM224	46.6675	114.8375	<5	0.3	50	650	775	5	<5	<10	1205	<100	3	10
IKM225	46.6675	114.8375	<5	<0.2	36	65	71	10	<5	<10	550	<100	4	<10

TABLE A-2.--Analyses of rock samples--Continued

Sample Number	Latitude	Longitude	Au (474) (ppb)	Ag (17) (ppm)	Cu (634) (ppm)	Pb (265) (ppm)	Zn (599) (ppm)	As (502) (ppm)	Sb (98) (ppm)	W (17) (ppm)	Mn (4289) (ppm)	Ba (154) (ppm)	Mo (24) (ppm)	Hg (1008) (ppb)
IKM226	46.6675	114.8375	<5	1.1	78	410	1190	17	<5	20	1420	<100	12	45
IKM227	46.6675	114.8375	<5	1.6	57	912	2118	10	<5	37	2130	<100	3	20
IKM228	46.6672	114.8383	<5	4.9	121	1005	2205	12	<5	43	1600	<100	42	35
IKM229	46.6672	114.8383	<5	0.5	18	118	420	9	<5	10	940	<100	6	15
IKM230	46.6672	114.8383	<5	<0.2	18	105	160	13	<5	<10	525	<100	2	10
IKM231	46.6672	114.8383	<5	<0.2	16	34	86	<5	<5	<10	560	<100	2	<10
IKM232	46.6672	114.8383	<5	<0.2	40	13	70	<5	<5	<10	540	<100	3	<10
IKM233	46.5511	115.1603	<5	<0.2	14	14	12	<5	<5	<10	110	<100	4	<10
IKM234	46.5486	115.1517	<5	<0.2	17	7	7	5	<5	<10	68	<100	5	<10
IKM239	46.8050	115.0981	<5	<0.2	3	6	55	<5	<5	<10	330	<100	4	<10
IKM240	46.6556	115.1044	<5	1.9	6	110	13	<5	<5	<10	112	<100	5	15
IKM242	46.7211	114.8653	<5	<0.2	14	5	7	<5	<5	<10	183	<100	1	<10
IKM248	46.7125	114.9314	<5	<0.2	12	32	9	10	<5	<10	532	<100	6	<10
IKM249	46.6694	114.7814	<5	<0.2	7	6	6	5	<5	<10	95	<100	3	10
IKM250	46.6694	114.7814	<5	0.4	6	102	47	23	<5	<10	105	<100	2	15
IKM251	46.6875	114.7669	7	<0.2	5	11	8	12	<5	<10	32	<100	4	20
IKM252	46.6875	114.7669	5	<0.2	7	19	30	15	<5	<10	280	<100	5	15
IKM253	46.6917	114.7653	<5	<0.2	2	9	83	<5	<5	<10	925	<100	3	10
IKM258	46.6675	114.8375	43	2.9	73	678	2250	<5	<5	30	2450	<100	2	125
IKM259	46.7050	114.8944	1785	9.2	31	18	3	3670	95	<10	33	<100	14	6680
IKM260	46.7050	114.8944	940	2.1	4	15	6	935	15	<10	65	<100	2	2765
IKM261	46.7050	114.8944	5665	5.0	5	15	6	5310	98	<10	17	<100	1	5570
IKM262	46.7050	114.8944	5540	4.7	4	13	5	7025	12	<10	30	<100	1	5850
IKM263	46.7050	114.8944	6875	6.5	15	22	24	3960	15	<10	40	<100	2	1950
IKM264	46.7050	114.8944	655	2.6	10	11	7	385	8	<10	55	<100	2	485
IKM265	46.7050	114.8944	18	0.1	3	6	34	20	<5	<10	40	<100	<1	225
IKM266	46.7050	114.8944	25	0.1	4	10	36	43	<5	<10	465	<100	<1	105
IKM272	46.5761	114.7467	90	1.4	2	5	2	95	13	<10	162	<100	<1	35
IKM273	46.5761	114.7467	130	65.0	9	40	12	36	1150	<10	35	<100	1	810
IKM274	46.7219	114.8119	<5	0.1	2	17	10	6	<5	<10	40	<100	<1	135
IKM275	46.7219	114.8119	6	0.2	4	19	28	10	<5	<10	65	<100	<1	50
IKM276	46.7219	114.8119	488	0.2	2	6	2	8	<5	<10	33	<100	<1	60
IKM277	46.7219	114.8119	<5	<0.1	1	9	6	<5	<5	<10	65	<100	<1	15
IKM278	46.7219	114.8119	<5	<0.1	1	18	16	<5	<5	<10	35	<100	<1	10
IKM279	46.7219	114.8119	<5	0.1	2	257	172	<5	<5	<10	525	<100	1	25
IKM280	46.7219	114.8119	<5	<0.1	1	40	42	<5	<5	<10	112	<100	<1	<10

TABLE A-2.--Analyses of rock samples--Continued

Sample Number	Latitude	Longitude	Au (474) (ppb)	Ag (17) (ppm)	Cu (634) (ppm)	Pb (265) (ppm)	Zn (599) (ppm)	As (502) (ppm)	Sb (98) (ppm)	W (17) (ppm)	Mn (4289) (ppm)	Ba (154) (ppm)	Mo (24) (ppm)	Hg (1008) (ppb)
IKM281	46.7219	114.8119	<5	<0.1	1	128	79	5	8	<10	290	100	<1	<10
IKM282	46.7219	114.8119	94	0.4	2	16	2	5	20	<10	18	<100	<1	45
IKM283	46.7219	114.8119	409	0.6	2	43	13	6	35	<10	40	<100	<1	55
IKM293	46.6367	115.1289	7	0.2	39	19	12	7	20	<10	85	<100	<1	50
IKM297	46.6381	115.1133	<5	1.5	23	62	87	28	145	<10	310	<100	<1	135
IKM298	46.6389	115.1156	10	8.2	4	60	32	15	40	<10	21	<100	<1	320
IKM307	46.6381	114.7019	<5	<0.1	2	11	14	<5	50	<10	215	<100	1	15
IKM342	46.5342	115.0667	15	0.1	39	13	82	<5	<5	<10	302	<100	<1	15
IKM345	46.5625	115.1094	<5	<0.1	37	8	52	5	<5	<10	175	<100	<1	10
IKM346	46.5522	115.1106	<5	<0.1	2	12	61	<5	<5	<10	152	<100	<1	10
IKM350	46.5772	115.1222	<5	<0.1	3	17	60	<5	<5	<10	357	<100	<1	25
IKM355	46.5286	115.4156	<5	0.1	5	6	7	<5	62	<10	68	<100	<1	15
IKM362	46.6094	115.4389	<5	0.1	3	6	2	<5	110	<10	30	<100	<1	10
IKM364	46.6125	115.4294	<5	0.4	45	5	37	<5	48	<10	185	<100	1	20
IKM365	46.6131	115.4281	<5	0.1	2	4	12	<5	42	<10	250	<100	<1	<10
IKM367	46.6225	115.4283	<5	0.3	44	4	6	<5	56	<10	142	<100	<1	25
IKM368	46.5728	114.7503	675	201.0	608	6	250	105	3.8%	<10	33	<100	<1	1850
IKM369	46.5728	114.7503	250	190.0	902	12	345	20	2.1%	<10	72	<100	<1	4175
IKM370	46.5728	114.7503	732	25.0	63	21	28	365	1.8%	<10	105	<100	<1	1280
IKM371	46.5728	114.7503	520	48.0	112	40	32	245	2.0%	<10	128	<100	<1	1880
IKM372	46.5728	114.7503	5	0.5	2	4	1	10	118	<10	90	<100	1	65
IKM373	46.5728	114.7503	10	0.4	3	20	21	8	120	<10	165	<100	<1	90
IKM374	46.5853	114.7333	<5	0.9	6	6	9	5	225	<10	112	100	<1	25
IKM378	46.7086	115.1606	<5	0.3	30	8	37	<5	72	<10	143	110	<1	10
IKM379	46.6483	114.8372	5	0.5	66	44	52	31	<5	<10	760	<100	<1	105
IKM380	46.6475	114.8369	5	1.5	94	155	230	<5	<5	<10	485	210	1	140
IKM381	46.6625	114.8389	7	0.6	4	90	282	<5	<5	<10	237	<100	<1	35
IKM382	46.6672	114.8489	10	0.1	8	32	27	192	<5	<10	112	<100	5	25
IKM383	46.6558	114.8522	13	0.1	2	14	38	40	<5	<10	325	<100	1	30
IKM384	46.6428	114.8483	10	1.0	8	113	116	12	<5	<10	340	<100	6	80
IKM385	46.6428	114.8483	172	0.8	9	112	145	12	<5	<10	375	105	1	75
IKM386	46.6428	114.8483	<5	0.4	8	60	51	11	<5	<10	153	<100	2	50
IKM387	46.6228	114.8403	5	0.1	18	<2	22	<5	<5	<10	3120	<100	<1	10
IKM388	46.6228	114.8400	8	0.7	127	32	136	7	<5	<10	3.5%	<100	5	125
IKM389	46.6225	114.8408	10	165.0	17	3.1%	2.4%	<5	<5	1510	1.3%	<100	17	1150
IKM390	46.6242	114.8403	13	41.0	29	1.8%	1.7%	37	<5	1460	2.1%	<100	15	165
IKM391	46.6261	114.8414	5	0.9	102	105	243	23	<5	10	1.7%	<100	8	45
IKM396	46.4656	114.9386	<5	<0.1	6	9	38	<5	<5	<10	260	100	<1	<10
IKM398	46.4639	115.0089	<5	<0.1	5	20	54	<5	<5	<10	265	<100	<1	<10
IKM399	46.5772	115.1217	<5	<0.1	2	27	40	<5	<5	<10	372	<100	1	15

TABLE A-2.--Analyses of rock samples--Continued

Sample Number	Latitude	Longitude	Au (474) (ppb)	Ag (17) (ppm)	Cu (634) (ppm)	Pb (265) (ppm)	Zn (599) (ppm)	As (502) (ppm)	Sb (98) (ppm)	W (17) (ppm)	Mn (4289) (ppm)	Ba (154) (ppm)	Mo (24) (ppm)	Hg (1008) (ppb)
IKM404	46.5161	115.1064	<5	<0.1	1	10	27	<5	<5	<10	60	<100	<1	<10
IKM405	46.5133	115.1072	<5	<0.1	2	15	58	<5	<5	<10	148	<100	<1	20
IKM406	46.4517	115.2422	30	0.1	21	5	12	<5	<5	<10	70	110	<1	45
IKM408	46.4444	115.5133	<5	<0.1	<1	7	7	<5	<5	<10	73	<100	<1	<10
IKM409	46.4206	115.5583	5	0.4	70	4	5	<5	<5	<10	22	<100	<1	<10
IKM415	46.5503	115.4636	<5	<0.1	5	6	10	<5	<5	<10	105	<100	<1	<10
IKM417	46.5894	115.3375	68	0.2	33	245	38	40	<5	<10	71	100	2	15
IKM419	46.5367	115.3194	<5	<0.1	2	5	54	<5	<5	<10	256	<100	<1	<10
IKM421	46.5561	115.3633	<5	<0.1	1	8	7	<5	<5	<10	55	<100	<1	<10
IKM426	46.4422	115.5492	<5	<0.1	1	2	2	<5	<5	<10	32	<100	<1	<10
IKM427	46.4236	115.5625	<5	<0.1	<1	3	2	<5	<5	<10	28	<100	<1	<10
IKM428	46.4236	115.5628	<5	<0.1	2	3	3	<5	<5	<10	26	100	<1	<10
IKM429	46.4592	115.6064	<5	0.2	1	70	108	<5	<5	<10	225	<100	1	10
IKM432	46.4514	115.6369	<5	<0.1	1	2	4	<5	<5	<10	42	<100	<1	<10
IKM433	46.4686	115.6347	<5	<0.1	4	22	30	<5	<5	<10	64	<100	<1	<10
IKM435	46.5414	115.5169	<5	<0.1	1	5	6	<5	<5	<10	62	<100	1	<10
IKM436	46.5569	115.5350	<5	<0.1	3	7	4	<5	<5	<10	49	170	<1	<10
IKM452	46.6772	115.3383	<5	<0.1	26	<2	117	<5	<5	<10	465	<100	1	50
IKM470	46.7203	115.0800	10	0.6	14	2	3	<5	<5	<10	36	100	<1	45
IKM477	46.7022	115.0069	17	0.2	3	4	12	<5	<5	<10	190	<100	<1	45
IKM478	46.5717	114.7506	7	0.3	3	<2	3	5	<5	<10	92	<100	<1	25
IKM479	46.5722	114.7486	<5	0.3	2	<2	5	<5	<5	<10	143	<100	1	20
IKM480	46.5697	114.7500	<5	0.1	32	<2	105	5	<5	<10	515	105	2	40
IKM481	46.5697	114.7531	10	0.1	3	5	15	9	<5	<10	127	<100	<1	40
IKM482	46.5703	114.7489	275	580.0	620	4	345	18	<5	<10	41	<100	<1	12750
IKM483	46.5725	114.7514	7	0.4	1	15	34	5	<5	<10	215	<100	<1	235
IKM484	46.5733	114.7492	155	27.0	32	28	7	<5	12	<10	83	<100	<1	220
IKM485	46.5733	114.7492	40	2.4	14	8	14	6	<5	<10	148	<100	<1	275
IKM486	46.5756	114.7525	<5	<0.1	2	<2	2	<5	<5	<10	162	<100	<1	<10
IKM487	46.5756	114.7525	92	2.8	4	2	15	17	10	<10	40	<100	<1	65
IKM488	46.5739	114.7542	7	0.3	2	<2	5	<5	<5	<10	145	<100	<1	25
IKM490	46.5764	114.7492	203	20.0	8	11	3	18	5	<10	122	<100	<1	250
IKM491	46.5764	114.7492	1405	450.0	730	168	67	9	250	<10	65	<100	1	3065
IKM492	46.6072	114.6992	12	1.0	1	4	18	<5	<5	<10	120	<100	<1	135
IKM493	46.6047	114.7044	53	1.3	2	24	10	28	<5	<10	115	<100	<1	210
IKM494	46.6042	114.7069	6	0.1	21	7	155	<5	<5	<10	495	100	2	1265
IKM495	46.5875	114.7292	28	0.5	2	8	2	<5	<5	<10	31	<100	1	140
IKM496	46.5900	114.7386	15	1.3	5	6	9	<5	<5	<10	140	<100	1	150
IKM497	46.6597	114.6281	12	0.2	3	16	45	<5	<5	<10	210	<100	<1	225
IKM498	46.5944	114.7272	<5	<0.1	3	2	5	<5	<5	<10	28	<100	<1	<10
IKM499	46.5944	114.7272	<5	<0.1	3	2	7	<5	<5	<10	290	<100	<1	<10

TABLE A-2.--Analyses of rock samples--Continued

Sample Number	Latitude	Longitude	Au (474) (ppb)	Ag (17) (ppm)	Cu (634) (ppm)	Pb (265) (ppm)	Zn (599) (ppm)	As (502) (ppm)	Sb (98) (ppm)	W (17) (ppm)	Mn (4289) (ppm)	Ba (154) (ppm)	Mo (24) (ppm)	Hg (1008) (ppb)
IKM502	46.5653	115.5103	<5	<0.1	5	2	4	<5	<5	<10	21	<100	<1	<10
IKM503	46.6314	115.5044	18	0.8	7	10	40	<5	<5	<10	2550	<100	2	15
IKM504	46.6591	114.6811	15	<0.2	14	6	42	5	<5	<10	155	165	1	20

Table A-3.--Descriptions of alluvial samples from the Kelly-Cayuse study area vicinity, Shoshone, Clearwater, and Idaho Counties, Idaho

[All pan samples, unless noted; bedrock samples denoted by suffix "B"; all sample volumes 0.2 ft^3 unless noted]

Number	Description
IKM001PB	Sample off bouldery, gneissic-granodiorite bedrock; gravel is locally 75 ft wide, 20 ft deep, 400 ft long; intermittent accumulations along channel. Volume 0.1 ft^3.
IKM005P	Gravel composed of yellow to brown, subrounded quartzite, schist, and gneiss; valley fill about 75 ft wide, estimated 15 ft deep.
IKM006P	Gravel composed of yellow to brown, subrounded quartzite, schist, and gneiss; valley fill estimated 100 ft wide and 50 ft deep.
IKM007P	Yellow and brown, rounded, cobbly gravel composed of quartzite and schist; at head of bar; gravel estimated 200 ft wide and 75 ft deep; gravel partially mined.
IKM010P	Yellow and brown, cobbly, rounded gravel composed of quartzite, schist, and gneiss; gravel is estimated 150 ft wide and 50 ft deep.
IKM011P	Gray to yellow, cobbly, well-rounded gravel composed of quartzite and schist; gravel is estimated 120 ft wide and 20 ft deep; 0.5-ft-long channel sample.
IKM017P	Gray to yellow, fine pebbles and cobbles composed of subangular quartzite, schist, and quartz. Gravel 15 to 30 ft thick.
IKM018P	Ilmenite and garnet concentrate with minor magnetite; medium- to coarse-grained. Associated, subrounded gold nuggets contain garnet, ilmenite, and schist. Sample weighed a few ounces.
IKM019P	Limonitic, clay-rich, intensely weathered, pebbly siltstone and sandstone. 1-ft-long channel sample.
IKM024P	Gray to yellow, limonitic, quartzitic soil, slopewash, and angular alluvium.
IKM025P	Yellow, pebbly, rounded gravel composed of quartzite, with estimated 10 percent ilmenite black sand. Valley fill estimated 200 ft wide and 20 ft deep.
IKM026P	Limonitic, sandy, pebbly, subrounded gravel composed of quartzite and vein quartz with cubic voids to 0.5 in. Three-ft-long channel sample.
IKM029P	Yellow to white, silty, clay-rich, fine- to medium-grained, quartzose sand; in Tertiary-age gravel.
IKM033P	Three-ft-long channel sample of limonitic, brown, pebbly, cobbly, quartzose, silty, sandy gravel at small pit in Tertiary-age gravel.
IKM034P	Ilmenite(?) chunks to 1/4 by 3/4 in; black, glossy, with quartz and schist inclusions. Sample weighed a few ounces.

Table A-3.--Descriptions of alluvial samples from the Kelly-Cayuse study area vicinity, Shoshone, Clearwater, and Idaho Counties, Idaho--Continued

Number	Description
IKM035P	Gray to yellow-brown, silty, sandy, colluvial, subangular gravel with pebbles of calc-silicate schist.
IKM037P	Yellow-brown, sandy, pebbly, cobbly, well-rounded gravel composed of quartzite and volcanic rocks; floodplain estimated 1,000 to 2,000 ft wide.
IKM038P	Gray to yellow, cobbly, well rounded gravel composed of granitic rocks, mafic rocks(?), and quartzite(?); gravel more than 1,000 ft wide; 4-ft-long channel sample.
IKM039P	Gray to yellow, subangular, sandy, pebbly gravel composed of porphyritic andesite and minor granitic rocks; gravel benches 10 to 15 ft thick.
IKM040P	Gray to yellow, sandy, cobbly, pebbly, rounded gravel composed of granitic rocks, porphyritic volcanic rocks, and minor schist and gneiss.
IKM041P	Gray to yellow, cobbly, pebbly, subrounded gravel composed of granitic rocks, some porphyritic volcanic rocks(?), and quartzite or quartz.
IKM042P	Gray to yellow, cobbly, bouldery, pebbly, rounded gravel composed of porphyritic andesite, granitic rocks, schist, and gneiss. Sample sluiced and panned. Volume 0.9 ft^3.
IKM043P	Gray to yellow, sandy, pebbly, cobbly, rounded gravel composed of porphyritic volcanic rocks, granitic rocks, schist, and gneiss.
IKM044P	Gray to yellow, sandy, bouldery, cobbly, pebbly, rounded gravel composed of schist, gneiss, and granitic and volcanic rocks.
IKM045P	Gray to yellow, sandy, bouldery, cobbly, pebbly rounded gravel composed of porphyritic volcanic, tuffaceous volcanic, and granitic rocks.
IKM046P	Gray to yellow, sandy, bouldery, cobbly, pebbly, rounded gravel composed of granitic rocks and quartzite.
IKM057P	Gray to yellow-brown, sandy, cobbly, pebbly, well-rounded gravel composed of schist, gneiss, and granitic and volcanic rocks,.
IKM058P	Yellow, sandy, pebbly, subangular gravel composed of granitic rocks.
IKM059PB	Yellow-brown, clay-rich, silty, sandy, cobbly, pebbly gravel composed of granitic, volcanic, schistose, and gneissic rock. On bedrock and in bedrock crevices.
IKM060P	Gray, sandy, pebbly, subrounded gravel composed of gneissic and granitic rocks. Estimated 10 percent black sand.
IKM061P	Gray to yellow, earthy colluvium with angular chunks of granitic and quartzose rock.

Table A-3.--Descriptions of alluvial samples from the Kelly-Cayuse study area vicinity, Shoshone, Clearwater, and Idaho Counties, Idaho--Continued

Number	Description
IKM062P	Gray to yellow, sandy, bouldery, cobbly, pebbly, subrounded gravel composed of quartzite, schist, gneiss, and minor granitic rocks.
IKM063P	Gray to yellow-brown, sandy, pebbly, subrounded gravel composed of quartzite and schist.
IKM064P	Gray to yellow, sandy, cobbly, pebbly, rounded gravel composed of quartzite, mica schist, and gneiss. Valley fill estimated 250 ft wide.
IKM065P	Gray to yellow, pebbly, subangular gravel composed of quartzite. Small amount of black sand and fine-grained, red rutile.
IKM066P	Yellow, sandy, cobbly, bouldery, pebbly, rounded gravel composed of quartzite with minor granitic, schistose, and gneissic rocks.
IKM068P	Gray to yellow-brown, sandy, pebbly, cobbly, rounded gravel composed of quartzite, gneiss, schist, and amphibolite.
IKM069P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subangular gravel composed of mica schist, quartzite, and gneiss. About 15 percent ilmenite sand.
IKM070P	Gray to yellow-brown, sandy, pebbly, bouldery, cobbly, subangular gravel composed of biotite schist and quartzite. About 5 percent black sand.
IKM071P	Gray to yellow-brown, sandy, silty, cobbly, pebbly, subangular gravel composed of quartzite and biotite schist. Volume 0.1 ft^3.
IKM072P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of quartzite, mica schist, and granitic rocks.
IKM073P	Yellow-brown, sandy, pebbly, cobbly, bouldery, rounded gravel composed of quartzite, porphyritic volcanic rock, schist, and quartz.
IKM074P	Yellow-brown, sandy, pebbly, bouldery, cobbly, subrounded gravel composed of quartzite and schistose gneiss.
IKM075P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subangular gravel composed of biotite schist and quartzite. About 5 percent red, coarse-grained garnet chips.
IKM077P	Gray to brown, sandy, pebbly, cobbly, bouldery, subangular gravel composed of calc-silicate rock, amphibolite, schist, gneiss, and porphyritic volcanic rock; brown cement.
IKM078P	Gray to yellow-brown, sandy, bouldery, cobbly, pebbly, rounded gravel composed of granitic, porphyritic volcanic, and calc-silicate rocks.
IKM079P	Yellow-brown, sandy, pebbly, cobbly, rounded gravel composed of porphyritic, granitic, and calc-silicate rocks, quartzite, and quartz.

Table A-3.--Descriptions of alluvial samples from the Kelly-Cayuse study area vicinity, Shoshone, Clearwater, and Idaho Counties, Idaho--Continued

Number	Description
IKM081P	Gray to yellow-brown, sandy, pebbly, bouldery, cobbly, rounded gravel composed of granitic, schistose, and volcanic rocks. Less than 10 ft thick.
IKM082PB	Gray to yellow-brown, bouldery, sandy, cobbly, pebbly, rounded gravel composed of granitic rock, schist, quartzite, volcanic rocks, and quartzite. Gravel about 10-ft-thick.
IKM084P	Gray to yellow-brown, sandy, pebbly, subrounded gravel composed of siltite and carbonate.
IKM086P	Gray, bouldery, angular gravel composed of calcareous siltite.
IKM087P	Gray to yellow-brown, sandy, pebbly, cobbly, subangular gravel composed of calcareous siltite.
IKM088P	Gray to yellow-brown, sandy, bouldery, cobbly, subangular gravel composed of calcareous siltite and quartzite.
IKM089P	Red-brown, sandy, pebbly, bouldery, cobbly, subangular gravel composed of quartzite, siltite, and granitic rocks
IKM090P	Red-brown, sandy, pebbly, bouldery, cobbly, subangular gravel composed of calcareous siltite, carbonate, quartzite, and granitic rocks.
IKM091P	Gray to red-brown, sandy, pebbly, bouldery, cobbly, subrounded gravel composed of carbonate rock, siltite, and quartzite.
IKM092P	Yellow-brown, sandy, pebbly, subangular gravel composed of quartzite, siltite, carbonate rock, and pegmatite.
IKM093P	Gray to yellow-brown, sandy, pebbly, bouldery, cobbly, subangular to subrounded gravel composed of quartzite, schist, gneiss, and calc-silicate rock.
IKM095P	Yellow, limonitic, sandy, pebbly, cobbly, bouldery, angular to subrounded gravel composed of quartzite and volcanic and granitic rocks.
IKM096PB	Red-brown, clay- and silt-rich, pebbly, sandy, rounded quartzitic gravel from crevice in bedrock below Tertiary-age gravel. 0.5-ft-long channel sample.
IKM098PB	Sample off gray, friable, weathered biotite-schist bedrock.
IKM099P	Yellow-brown, cobbly, sandy, pebbly, subangular gravel composed of quartzite, quartz, and schist.
IKM100P	Brown, sandy, silty, bouldery, cobbly, subangular gravel composed of quartzite and schist.
IKM130P	Gray to yellow-brown, sandy, pebbly, bouldery, cobbly, subrounded gravel composed of granodiorite, volcanic breccia, calc-silicate rock, and quartzite.

Table A-3.--Descriptions of alluvial samples from the Kelly-Cayuse study area vicinity, Shoshone, Clearwater, and Idaho Counties, Idaho--Continued

Number	Description
IKM131PB	Yellow-brown, sandy, bouldery, cobbly, pebbly, subangular gravel composed of calc-silicate rock, quartzite, and porphyritic volcanic rocks.
IKM132P	Yellow-brown, sandy, pebbly, bouldery, cobbly, subrounded gravel composed of porphyritic volcanic, granitic, and calc-silicate rocks, quartzite, and siltite.
IKM133P	Yellow-brown, sandy, cobbly, pebbly, subrounded gravel composed of quartzite and calc-silicate rock.
IKM134P	Gray to yellow-brown, sandy, pebbly, bouldery, cobbly, rounded gravel composed of quartzite, granitic rocks, gneiss, schist, and volcanic rocks. Gravel at least 10 ft thick.
IKM135P	Yellow-brown, pebbly, cobbly, sandy, bouldery, rounded gravel composed of quartzite and granitic rocks. Estimated about 20 percent black minerals, mostly ilmenite. Gravel at least 10 ft thick.
IKM136P	Yellow-brown, pebbly, cobbly, sandy, bouldery, subrounded gravel composed of granitic rocks, quartzite, quartz, amphibolite, and basalt. Gravel about 15 ft thick.
IKM137P	Yellow-brown, sandy, pebbly, bouldery, cobbly, subrounded gravel composed of gneiss, schist, granitic rocks, basalt, and amphibolite. Estimated 10 percent black minerals. Gravel about 15 ft thick.
IKM138P	Yellow-brown, silty, sandy, pebbly, bouldery, cobbly, subrounded gravel composed of granitic, gabbroic, and quartzitic rocks.
IKM139P	Gray to yellow-brown, sandy, pebbly, bouldery, cobbly, rounded gravel composed of quartzite, schist, gneiss, and granitic and volcanic rocks. Gravel 5 ft thick.
IKM140P	Gray to yellow-brown, sandy, pebbly, bouldery, cobbly, subrounded gravel composed of schist, gneiss, and granitic rocks.
IKM141P	Yellow-brown, silty, sandy, cobbly, pebbly, well rounded gravel composed of granitic rocks, schist, gneiss, volcanic rocks, quartzite, and diorite. Gravel about 15 ft thick.
IKM142P	Gray, sandy, pebbly, cobbly, bouldery, subangular gravel composed of granitic rocks in large alluvial fan. Gravel at least 50 ft thick.
IKM143P	Yellow-brown, silty, sandy, cobbly, pebbly gravel composed of granitic rocks, quartzite, diorite, and calc-silicate rock. Gravel 5 to 10 ft thick.
IKM145P	Gray to yellow-brown, sandy, pebbly, bouldery, cobbly, subangular gravel composed of quartzite, calc-silicate rock, and diorite.

Table A-3.--Descriptions of alluvial samples from the Kelly-Cayuse study area vicinity, Shoshone, Clearwater, and Idaho Counties, Idaho--Continued

Number	Description
IKM148P	Gray to yellow-brown, sandy, bouldery, cobbly, pebbly, subrounded gravel composed of quartzite and schist. Gravel about 100 ft wide, with 10-ft-high benches.
IKM151P	Gray to yellow-brown, cobbly, sandy, pebbly, rounded gravel composed of granitic rocks, quartzite, schist, gneiss, and volcanic rocks. Gravel at least 7 ft thick.
IKM152P	Gray to yellow, sandy, pebbly, cobbly, rounded gravel of quartzite, granitic rocks, gneiss, schist, and volcanic rocks.
IKM153P	Gray to yellow-brown, sandy, cobbly, pebbly gravel of quartzite and granitic rocks.
IKM154P	Gray to yellow, sandy, pebbly, bouldery, cobbly, subrounded gravel composed of granitic rocks, quartzite, gneiss, schist, and calc-silicate and volcanic rocks
IKM155P	Yellow-brown, sandy, bouldery, cobbly, subrounded gravel composed of quartzite, granitic rocks, schist, and gneiss.
IKM156P	Gray to yellow-brown, sandy, bouldery, cobbly, pebbly, subangular gravel composed of granitic rocks, gneiss, schist, quartz, and volcanic rocks. Gravel about 50 ft wide.
IKM157P	Limonitic, sandy, bouldery, cobbly, pebbly, subrounded gravel composed of granitic rocks, quartzite, and volcanic rocks. Gravel about 15 ft thick.
IKM158P	Gray, sandy, pebbly, angular gravel composed of granitic rocks and quartz in narrow gulch.
IKM159P	Gray to yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of granitic rocks, schist, and volcanic rock. Gravel at least 400 ft wide and more than 10 ft thick.
IKM160P	Gray to yellow-brown, sandy, cobbly, pebbly, rounded gravel composed of granitic rocks, quartzite, schist, gneiss, diorite, and volcanic rocks.
IKM161P	Yellow-brown, sandy, bouldery, cobbly, pebbly, subangular gravel composed of granitic rocks, volcanic rocks, quartzites, and calc-silicate rock. Gravel more than 200 ft wide and at least 5 ft thick. Volume 0.1 ft^3.
IKM162P	Yellow-brown, sandy, pebbly, bouldery, cobbly, subrounded gravel composed of granitic rocks, quartzite, and volcanic and calc-silicate rocks. Gravel at least 50 ft wide and more than 5 ft thick.
IKM163PB	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of granitic and volcanic rocks and quartzite. Gravel less than 50 ft wide and less than 5 ft thick.
IKM164P	Gray to yellow-brown, sandy, bouldery, cobbly, pebbly, subrounded gravel composed of quartzite and granitic and volcanic rocks. Gravel at least 400 ft wide.

Table A-3.--Descriptions of alluvial samples from the Kelly-Cayuse study area vicinity, Shoshone, Clearwater, and Idaho Counties, Idaho--Continued

Number	Description
IKM167P	Gray to yellow-brown, silty, cobbly, pebbly sand composed of granitic rocks, quartzite, and volcanic rocks.
IKM168P	Gray to yellow-brown, sandy, bouldery, cobbly, pebbly, subrounded gravel composed of quartzite and granitic, volcanic, and calc-silicate rocks.
IKM170P	Gray, silty, sandy, pebbly colluvium composed of granitic and porphyritic volcanic rocks. Volume 0.1 ft^3.
IKM191P	Brown, silty, sandy, pebbly gravel composed of angular granitic rock fragments and well-rounded quartzite and porphyritic volcanic rock fragments.
IKM192P	Gray to yellow-brown, sandy, pebbly, bouldery, angular to rounded gravel composed of granitic rocks, quartzite, and volcanic rocks. Visible gold.
IKM194P	Gray to yellow-brown, sandy, pebbly, bouldery, cobbly, angular gravel composed of granitic rocks, quartz, quartzite, gneiss, and schist. Gravel less than 20 ft wide and about 5 ft thick.
IKM195PB	Gray to yellow-brown, silty, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of quartzite, volcanic rocks, gneiss, and schist. Visible gold.
IKM196PB	Gray to yellow-brown, sandy, silty, pebbly, cobbly, bouldery gravel composed of subangular schist and quartzite.
IKM197P	Yellow-brown, silty, sandy, pebbly, bouldery, cobbly subrounded gravel composed of quartzite, granitic and volcanic rocks, schist, and gneiss. 3.5-ft-long channel sample.
IKM198P	Yellow-brown, silty, sandy, bouldery, cobbly, pebbly subrounded gravel composed of granitic rocks, gneiss, quartzite, and calc-silicate rocks. 4.3-ft-long channel sample.
IKM199P	Gray to yellow-brown, sandy, bouldery, cobbly, pebbly, subrounded gravel composed of quartzite, quartz, granitic rocks, schist, and gneiss.
IKM200P	Brown, silty, sandy, bouldery, cobbly, pebbly, subrounded gravel composed of porphyritic volcanic rocks, granitic rocks, and quartzite.
IKM207P	Pebbly, cobbly, rounded gravel.
IKM208P	Gravel from stream bank; some black sand. A few pounds of sample.
IKM209P	Dry, brown, silty, sandy alluvium from dry stream bed. Volume 0.1 ft^3.
IKM213P	Cobbly gravel composed of well-rounded metamorphic rocks; from bank near stream.

Table A-3.--Descriptions of alluvial samples from the Kelly-Cayuse study area vicinity, Shoshone, Clearwater, and Idaho Counties, Idaho--Continued

Number	Description
IKM214P	Gray to yellow-brown, sandy, bouldery, pebbly, cobbly, subrounded gravel composed of quartzite, schist, and granitic rocks. Gravel about 150 ft wide and 5 to 15 ft thick.
IKM215P	Well-rounded gravel composed of metamorphic rock fragments and minor calc-silicate rock; from stream-cut bank.
IKM216P	Gray to yellow-brown, silty, sandy, pebbly gravel composed of granitic rocks, quartzite, and porphyritic rhyolite.
IKM217P	Gray to yellow-brown, silty, sandy, cobbly, pebbly, subangular gravel composed of quartzite, granitic rocks(?), schist, and gneiss.
IKM235P	Gray to yellow-brown, sandy, cobbly, pebbly, subrounded gravel composed of quartzose granitic, calc-silicate, and porphyritic volcanic rocks; 2.7-ft-long channel sample. Gravel at least 5 ft thick.
IKM236PB	Gray to yellow-brown, silty, sandy, pebbly, subangular gravel composed of gneiss, quartzite, and biotite schist.
IKM237PB	Gray to yellow-brown, silty, sandy, pebbly, subrounded gravel composed of quartzite, schist, and granitic rocks.
IKM238PB	Yellow-brown, silty, sandy, pebbly, subangular gravel composed of quartz, quartzite, and, minor biotite schist on bedrock composed of decomposed schist.
IKM241P	Gray to yellow-brown, silty, sandy, bouldery, cobbly, pebbly, subangular gravel composed of quartzite, biotite gneiss, and granitic and volcanic rocks.
IKM243PB	Gray, sandy, pebbly, bouldery gravel composed of granitic rocks; sample from beneath large boulders. Gravel about 50 ft thick.
IKM244P	Gray, sandy, cobbly, pebbly, subrounded gravel composed of granitic rocks, quartzite, and volcanic rocks.
IKM245P	Gray to yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of quartzite and granitic and volcanic rocks.
IKM246P	Gray to yellow-brown, sandy, pebbly, bouldery, cobbly, subrounded gravel composed of granitic rocks, quartzite, and volcanic rocks.
IKM247P	Yellow-brown, sandy, pebbly, bouldery, cobbly, subrounded gravel composed of granitic rocks, quartzite, and volcanic rocks. Gravel at least 500 ft wide and more than 10 ft thick.
IKM254P	Gray to yellow-brown, sandy, pebbly, bouldery, cobbly, subrounded gravel composed of granitic and porphyritic volcanic rocks.
IKM255P	Gray to yellow-brown, sandy, pebbly, bouldery, cobbly gravel composed of granitic and volcanic rocks, quartzite, and quartz.

Table A-3.--Descriptions of alluvial samples from the Kelly-Cayuse study area vicinity, Shoshone, Clearwater, and Idaho Counties, Idaho--Continued

Number	Description
IKM256P	Gray to yellow-brown, sandy, pebbly, bouldery, cobbly gravel composed of porphyritic-volcanic and granitic rocks and pegmatite.
IKM257P	Gray to yellow-brown, sandy, pebbly, bouldery, cobbly, subrounded gravel composed of granitic and volcanic rocks, quartzite, and quartz.
IKM267P	Gray to yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of volcanic rocks (some porphyritic) and quartzite.
IKM268P	Gray to yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of porphyritic volcanic rocks, breccia, and quartzite.
IKM269P	Gray, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of granitic rocks. Volume 0.1 ft^3.
IKM270P	Gray to yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of granite and porphyritic volcanic rocks.
IKM271P	do...
IKM284PB	Gray to yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of granitic rocks, schist, gneiss, porphyritic volcanic rocks, and quartzite. Gravel 15 to 30 ft thick.
IKM285P	Gray to yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of granitic rocks, schist, gneiss, quartzite, quartz, and porphyritic volcanic rocks. Gravel 10 ft thick.
IKM286P	Gray, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of granitic and porphyritic volcanic rocks.
IKM287P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of granitic rocks, gneiss, schist, quartzite, and porphyritic volcanic rocks.
IKM288P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of porphyritic volcanic rocks, quartzite, schist, and gneiss.
IKM289P	Gray to yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of granitic and porphyritic volcanic rocks, schist and quartzite.
IKM290P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of granitic rocks with minor quartzite and porphyritic volcanic rocks.
IKM291P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of granitic rocks, quartzite, and porphyritic volcanic rocks.

Table A-3.--Descriptions of alluvial samples from the Kelly-Cayuse study area vicinity, Shoshone, Clearwater, and Idaho Counties, Idaho--Continued

Number	Description
IKM292P	Gray to yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of granitic and porphyritic volcanic rocks, quartzite, quartz, gneiss, and schist.
IKM294P	Yellow-brown sand 5 to 10 ft thick.
IKM295P	Gray to yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of granitic rocks, schist, porphyritic volcanic rocks, gneiss, and quartzite. Gravel 50 to 150 ft wide and 5 to 10 ft thick.
IKM296P	Gray to yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of granitic rocks, schist, and gneiss.
IKM299P	Yellow-brown, sandy, pebbly, subangular gravel composed of granitic rocks, quartz, pegmatite, schist, and gneiss.
IKM300P	Gray to yellow-brown, pebbly sand.
IKM301P	Yellow, sandy, pebbly, cobbly, bouldery, angular to subrounded gravel composed of quartzite and volcanic and granitic rocks.
IKM302P	Yellow, sandy, pebbly, cobbly, bouldery gravel composed of granitic rocks and volcanic breccia.
IKM303P	Yellow, sandy, pebbly, cobbly, bouldery, subrounded to rounded gravel composed of granitic and volcanic rocks.
IKM304P	Yellow, silty, sandy, pebbly, cobbly, bouldery, subrounded to rounded gravel composed of volcanic and granitic rocks.
IKM305P	Yellow, silty, sandy, pebbly, cobbly, bouldery gravel composed of volcanic and granitic rocks.
IKM306P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of granitic rocks, minor quartzite, and schist.
IKM308P	Yellow, sandy, pebbly, cobbly, bouldery, angular to subrounded gravel composed of schist, gneiss, quartzite, and argillite.
IKM309P	Yellow, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of volcanic and granitic rocks, gneiss, calc-silicate rock, and quartzite.
IKM310P	Yellow, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of granitic rocks, schist, gneiss, and hornfels.
IKM311P	Yellow, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of granitic rocks, calc-silicate rock, quartzite, volcanic rocks, and gneiss.
IKM312P	Yellow, silty, sandy, pebbly, cobbly, bouldery, subrounded to rounded gravel composed of calc-silicate rock, quartzite, volcanic rocks, granite, and pegmatite.
IKM313P	Yellow, sandy, pebbly, cobbly, bouldery gravel composed of granite, quartzite, and rhyolite.

Table A-3.--Descriptions of alluvial samples from the Kelly-Cayuse study area vicinity, Shoshone, Clearwater, and Idaho Counties, Idaho--Continued

Number	Description
IKM314P	Yellow, sandy, pebbly, cobbly, bouldery gravel composed of granite, andesite, quartz, calc-silicate rock, gneiss, quartzite, and rhyolite.
IKM315P	Yellow, sandy, pebbly, cobbly, bouldery, rounded to subrounded gravel composed of granite, volcanic rocks, quartzite, quartz, and calc-silicate rock.
IKM316P	Yellow, sandy, pebbly, cobbly, bouldery gravel composed of granite and schist.
IKM317P	Yellow, sandy, pebbly, cobbly, rounded to subrounded gravel composed of granite, volcanic rocks, quartz, and calc-silicate rock.
IKM318P	Yellow, sandy, pebbly, cobbly, bouldery, subrounded to rounded gravel composed of granite, rhyolite, schist, gneiss, and quartzite.
IKM319P	Yellow, sandy, pebbly, cobbly, bouldery gravel composed of granite, gneiss, schist, calc-silicate and volcanic rocks, and quartzite.
IKM320P	Yellow sandy gravel composed of volcanic and granitic rocks.
IKM321P	do...
IKM322P	do...
IKM323P	Yellow, micaceous, carbonaceous gravel composed of volcanic and granitic rocks.
IKM324P	do...
IKM325P	Yellow, micaceous, carbonaceous gravel composed of volcanic, granitic, and metamorphic rocks.
IKM326P	Yellow, sandy, pebbly, cobbly, bouldery gravel composed of decomposed granitic rocks, mostly grus.
IKM327P	Yellow, sandy, pebbly, cobbly, bouldery gravel composed of granitic, volcanic, and metamorphic rocks.
IKM328P	Yellow, silty, sandy, bouldery gravel composed of granitic rocks and minor volcanic rocks.
IKM329P	Yellow, sandy, pebbly, cobbly, bouldery gravel composed of granite and minor rhyolite.
IKM330P	Yellow, silty, sandy, pebbly, cobbly, bouldery gravel composed of granitic, volcanic, and calc-silicate rocks.
IKM331P	Yellow, silty, sandy, pebbly, cobbly, bouldery gravel composed of granitic and volcanic rocks and pegmatitic(?) quartz.
IKM332P	Yellow, silty, sandy, pebbly, cobbly, bouldery gravel composed of granitic and volcanic rocks, calc-silicate rock, gneiss, diorite, quartzite, and pegmatite.

Table A-3.--Descriptions of alluvial samples from the Kelly-Cayuse study area vicinity, Shoshone, Clearwater, and Idaho Counties, Idaho--Continued

Number	Description
IKM333P	Yellow, silty, sandy, pebbly, cobbly, bouldery gravel composed of granitic and volcanic rocks, calc-silicate rock, gneiss, diorite, quartzite, pegmatite, and pyroxenite.
IKM334P	Yellow, silty, sandy, pebbly, cobbly, bouldery, angular gravel composed of granitic rocks and minor diorite and metamorphic rocks.
IKM335P	Yellow, silty, sandy, pebbly, cobbly, bouldery, angular to rounded gravel composed of granitic rocks, diorite, schist, gneiss, pegmatite, quartz, and calc-silicate rock.
IKM336P	Yellow, silty, sandy, pebbly, cobbly, bouldery gravel composed of calc-silicate rock, gneiss, granitic rocks, quartzite, and tremolite(?).
IKM337P	Yellow, sandy, pebbly, cobbly, bouldery, angular to rounded gravel composed of quartzite, calc-silicate rock, gneiss, granitic rocks, diorite, and gabbro.
IKM338P	Yellow, sandy, pebbly, cobbly, bouldery gravel composed of granitic and calc-silicate rocks, gneiss, quartzite, diorite, and gabbro.
IKM339P	Yellow, sandy, pebbly, cobbly, bouldery, angular to subrounded gravel composed of granitic rocks, diorite, gneiss, and abundant quartz.
IKM340P	do...
IKM341P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of granitic and porphyritic volcanic rocks. Volume 0.1 ft^3.
IKM343P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of granitic rocks and minor porphyritic rocks.
IKM344P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of pink granite.
IKM347P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of coarse-grained pink granite and minor porphyritic volcanic rocks.
IKM348P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of granitic and porphyritic rocks.
IKM349P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of granitic and porphyritic volcanic rocks and minor gneiss and pegmatite.
IKM351P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of granitic and porphyritic volcanic rocks and quartz.
IKM352P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded to rounded gravel composed of granitic and porphyritic volcanic rocks, schist, and gneiss. Gravel 5 to 10 ft thick.

Table A-3.--Descriptions of alluvial samples from the Kelly-Cayuse study area vicinity, Shoshone, Clearwater, and Idaho Counties, Idaho--Continued

Number	Description
IKM353P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of granitic and porphyritic volcanic rocks and abundant simple pegmatite.
IKM354P	Yellow-brown, sandy, pebbly, cobbly, bouldery, angular gravel composed of granitic rocks, pegmatite, and porphyritic volcanic rocks.
IKM356P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of granitic and porphyritic volcanic rocks and simple pegmatite.
IKM357P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of granitic and porphyritic volcanic rocks, schist, gneiss, and quartzite.
IKM358P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subangular gravel composed of granitic rocks, schist, gneiss, and porphyritic volcanic rocks.
IKM359P	Yellow-brown, sandy, pebbly, cobbly, bouldery, rounded gravel composed of granitic and porphyritic volcanic rocks and quartzite. Gravel about 5 ft thick.
IKM360P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subangular gravel composed of granitic rocks, pegmatite, and diorite.
IKM361P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of granitic rocks, schist, gneiss, porphyritic volcanic rocks, pegmatite, and quartz. Gravel 5 to 25 ft thick.
IKM363P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of granitic rocks, gneiss, and schist.
IKM366P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of granitic rocks, gneiss, schist, and porphyritic volcanic rocks. Gravel 5 ft thick.
IKM375P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of granitic rocks, quartzite, porphyritic volcanic rocks, quartz, schist, and gneiss.
IKM376P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of granitic rocks, schist, gneiss, quartzite, and porphyritic volcanic rocks.
IKM377P	Yellow-brown sand with minor pebbles along bouldery creek bottom. Most pebbles composed of schist, gneiss, granitic rocks, and quartz.
IKM392P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subangular gravel composed of granitic rocks and minor porphyritic volcanic rocks.
IKM393P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of granitic rocks and minor porphyritic volcanic rocks.

Table A-3.--Descriptions of alluvial samples from the Kelly-Cayuse study area vicinity, Shoshone, Clearwater, and Idaho Counties, Idaho--Continued

Number	Description
IKM394P	Gray to yellow-brown, sandy, pebbly, cobbly, bouldery, subangular gravel composed of granitic rocks and aplite. Volume 0.1 ft^3.
IKM395P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of granitic rocks and minor porphyritic volcanic rocks.
IKM397P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of granitic rocks, pegmatite, and porphyritic volcanic rocks.
IKM400P	Yellow-brown, sandy, pebbly cobbly, bouldery, subangular gravel composed of granitic, brecciated granitic, and porphyritic volcanic rocks.
IKM401P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subangular gravel composed of granitic, brecciated granitic, and minor porphyritic volcanic rocks.
IKM402P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of granitic and porphyritic volcanic rocks.
IKM403P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of granitic and porphyritic-volcanic rocks and minor quartz.
IKM407P	Yellow-brown, sandy, pebbly, subangular gravel composed of granitic rocks, diorite, and porphyritic volcanic rocks. Volume 0.1 ft^3.
IKM410P	Yellow-brown, sandy, pebbly, cobbly, subangular gravel composed of granitic rocks, pegmatite, schist, gneiss, and quartz. Estimated 2 percent garnet sand.
IKM411P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of quartzite, granitic and porphyritic volcanic rocks, schist, and gneiss.
IKM412P	Yellow-brown, pebbly sand composed of angular granitic rocks and pegmatite. Volume 0.1 ft^3.
IKM413P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of quartzite, granitic rocks, pegmatite, porphyritic volcanic rocks, schist, and gneiss.
IKM414P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of quartzite, granitic rocks, schist, gneiss, and porphyritic volcanic rocks.
IKM416P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subangular gravel composed of granitic rocks and minor porphyritic volcanic rocks. Volume 0.1 ft^3.
IKM418P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subangular gravel composed of granitic rocks.

Table A-3.--Descriptions of alluvial samples from the Kelly-Cayuse study area vicinity, Shoshone, Clearwater, and Idaho Counties, Idaho--Continued

Number	Description
IKM420P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subangular gravel composed of granitic rocks, gneiss, schist, and porphyritic rocks.
IKM422P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of granitic rocks, gneiss, schist, porphyritic volcanic rocks, and pegmatite.
IKM423P	Yellow-brown, sandy, pebbly, cobbly, subrounded gravel composed of granitic rocks, schist, gneiss, porphyritic volcanic rocks, and pegmatite.
IKM424P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of granitic rocks, schist, gneiss, porphyritic volcanic rocks, pegmatite, and quartz.
IKM425P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of granitic rocks, schist, gneiss, pegmatite, and porphyritic volcanic rocks.
IKM430P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subangular gravel composed of granitic and porphyritic volcanic rocks and quartz.
IKM431P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of quartzite, granitic rocks, schist, gneiss, and minor porphyritic volcanic rocks. Estimated 2 percent garnet sand.
IKM434P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of quartzite, granitic rocks, schist, gneiss, and porphyritic volcanic rocks.
IKM437P	Yellow-brown to gray, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of gneiss, schist, and granitic and porphyritic volcanic rocks. Gravel 5 to 10 ft thick.
IKM438P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subangular gravel composed of granitic rocks, schist, gneiss, and pegmatite.
IKM439PB	Brown, silty, sandy, pebbly, cobbly, bouldery, subangular gravel composed of schist, gneiss, granitic rocks, and pegmatite.
IKM440P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of schist, gneiss, granitic rocks, pegmatite, and porphyritic rocks.
IKM441P	Yellow-brown, sandy, pebbly, cobbly, bouldery, angular gravel composed of granitic and porphyritic volcanic rocks.
IKM442P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of granitic and porphyritic volcanic rocks.
IKM443P	Yellow-brown, sandy, pebbly, cobbly, bouldery, angular gravel composed of granitic and porphyritic volcanic rocks.
IKM444P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of granitic and porphyritic volcanic rocks.

Table A-3.--Descriptions of alluvial samples from the Kelly-Cayuse study area vicinity, Shoshone, Clearwater, and Idaho Counties, Idaho--Continued

Number	Description
IKM445P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subangular gravel composed of granitic rocks, schist, gneiss, and porphyritic volcanic rocks.
IKM446P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of granitic rocks, schist, gneiss, quartzite, pegmatite, and porphyritic volcanic rocks.
IKM447P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subangular gravel composed of schist, gneiss, and granitic and porphyritic volcanic rocks.
IKM448P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of granitic rocks, schist, gneiss, quartzite, pegmatite, and porphyritic volcanic rocks.
IKM449P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of schist, gneiss, granitic rocks, quartzite, and porphyritic volcanic rocks.
IKM450P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of granitic rocks, schist, gneiss, quartzite, porphyritic volcanic rocks, and pegmatite.
IKM451P	Gray, silty, sandy, pebbly, subangular gravel composed of granitic rocks and pegmatite; gravel about 3 ft wide and 0.25 ft deep.
IKM453P	Gray to yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of granitic and porphyritic volcanic rocks, quartzite, schist, gneiss, and pegmatite.
IKM454P	Gray to yellow-brown, silty, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of granitic rocks, schist, gneiss, quartzite, pegmatite, and porphyritic volcanic rocks.
IKM455P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of schist, gneiss, quartzite, and granitic rocks.
IKM456P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of schist, gneiss, quartzite, granitic rocks, and pegmatite.
IKM457P	Yellow-brown, silty, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of schist, gneiss, quartzite, granitic rocks, and pegmatite.
IKM458P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of schist, gneiss, quartzite, granitic rocks, and pegmatite.
IKM459P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of schist, gneiss, quartzite, pegmatite, and granitic rocks. Gravel 5 to 10 ft thick.
IKM460P	Gray, silty sand with 0.3-ft-thick, yellow-brown, silty, clay layers.

Table A-3.--Descriptions of alluvial samples from the Kelly-Cayuse study area vicinity, Shoshone, Clearwater, and Idaho Counties, Idaho--Continued

Number	Description
IKM461P	Yellow-brown, pebbly sand with 0.25- to 0.5-ft-thick clay layers.
IKM462P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of schist, gneiss, quartzite, granitic rocks, and pegmatite; estimated 5 percent garnet.
IKM463PB	Yellow-brown, sandy, pebbly, cobbly, bouldery, subangular gravel composed of schist, gneiss, granitic rocks, and pegmatite.
IKM464P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of gneiss, porphyritic volcanic rocks, schist, granitic rocks, quartzite, and pegmatite.
IKM465P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of schist, gneiss, porphyritic volcanic rocks, quartzite, granitic rocks, and pegmatite.
IKM466P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subangular gravel composed of schist, gneiss, and quartz.
IKM467P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of porphyritic volcanic rocks, quartzite, schist, gneiss, granitic rocks, and pegmatite.
IKM468P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of granitic and porphyritic volcanic rocks, schist, and gneiss.
IKM469P	Gray to yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of granitic and porphyritic volcanic rocks, schist, gneiss, and quartzite. Gravel on wide, flat floodplain; about 7 ft thick.
IKM471P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of granitic rocks, quartzite, porphyritic volcanic rocks, schist, gneiss, and pegmatite.
IKM472P	Yellow-brown, silty, sandy, pebbly, cobbly, bouldery, subangular gravel composed of quartzite, phyllite, and schist.
IKM473P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subangular gravel composed of quartzite, phyllite, and schist.
IKM474P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of quartzite, schist, gneiss, granitic rocks, and pegmatite.
IKM475P	Yellow, limonitic, silty, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of quartzite, schist, and porphyritic volcanic and granitic rocks.
IKM476P	Gray to yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of granitic rocks, minor schist, gneiss, and porphyritic volcanic rocks.

Table A-3.--Descriptions of alluvial samples from the Kelly-Cayuse study area vicinity, Shoshone, Clearwater, and Idaho Counties, Idaho--Continued

Number	Description
IKM489P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subangular gravel composed of porphyritic volcanic rocks, quartzite, and calc-silicate rock.
IKM500P	Yellow-brown, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of granitic rocks, quartzite, porphyritic volcanic rocks, schist, gneiss, and pegmatite.
IKM501P	Yellow-brown, silty, sandy, pebbly, cobbly, bouldery, subrounded gravel composed of granitic rocks, quartzite, schist, gneiss, porphyritic volcanic rocks, and pegmatite

Table A-4.--Analyses of alluvial-sample concentrates from the Kelly-Cayuse Study area vicinity, Shoshone, Clearwater, and Idaho Counties, Idaho.

[ft^3, cubic foot; oz/yd^3, troy ounce per cubic yard; $/yd^3, dollar per cubic yard at gold price of $380 per troy ounce; ppb, part per billion; ppm, part per million; %, percent; ND, not detected; NA, not available or applicable; <, less than; *, contamination of gold and silver content suspected and not used in statistics; IKM018P and IKM034P not used statistically; anomalous thresholds shown beneath element symbol; underlining denotes anomalous samples; latitudes and longitudes based on 1927 North American datum]

Sample Number	Latitude	Longitude	Volume ft^3	Au oz/yd^3 (0.001671)	Au $/yd^3	Au (2074) (ppb)	Ag (0.5) (ppm)	Cu (32) (ppm)	Pb (31) (ppm)	Zn (73) (ppm)	As (14) (ppm)	Sb (3) (ppm)	W (13) (ppm)	Mn (565) (ppm)	Ba (59) (ppm)	Mo (3.6) (ppm)	Hg (99) (ppb)	Ce (633) (ppm)
IKM001P	46.7150	115.1831	0.1	0.000052	0.02	18	<0.1	15	3	36	<5	<5	<10	145	<100	1	10	92
IKM005P	46.6944	115.0811	0.1	ND	ND	<5	<0.1	7	3	25	<5	<5	<10	150	<100	<1	15	17
IKM006P	46.6917	115.0778	0.1	0.000061	0.02	<5	<0.1	17	4	46	<5	<5	<10	218	<100	1	10	25
IKM007P	46.7242	115.0808	0.1	ND	ND	10	<0.1	6	2	10	<5	<5	<10	92	<100	<1	15	65
IKM010P	46.7331	115.0764	0.1	ND	ND	5	<0.1	8	3	15	<5	<5	<10	60	<100	1	25	73
IKM011P	46.7433	115.0692	0.1	ND	ND	50	<0.1	7	4	10	<5	<5	<10	62	<100	<1	25	44
IKM017P	46.7681	115.1275	0.1	ND	ND	<5	<0.1	3	2	16	<5	<5	<10	55	<100	<1	15	53
IKM018P	46.7581	115.0797	NA	ND	ND	15800	<0.1	4	5	5	<5	<5	<10	118	<100	<1	30	225
IKM019P	46.7956	115.1111	0.1	ND	ND	195	<0.1	2	2	9	<5	<5	<10	10	<100	<1	<10	68
IKM024P	46.7803	115.1331	0.1	0.000043	0.02	53	<0.1	3	2	9	<5	<5	<10	20	<100	<1	<10	155
IKM025P	46.7722	115.1308	0.1	ND	ND	7	<0.1	3	2	10	<5	<5	<10	60	<100	<1	<10	176
IKM026P	46.7983	115.1111	0.1	0.006867	2.61	7250	<0.1	7	6	15	<5	<5	<10	68	<100	<1	<10	122
IKM029P	46.6903	115.0683	0.1	0.000017	0.01	215	<0.1	15	7	29	<5	<5	<10	155	<100	<1	15	10
IKM033P	46.7944	115.1056	0.1	0.000781	0.30	75	<0.1	22	5	14	<5	<5	<10	120	<100	<1	35	250
IKM034P	46.7572	115.0883	NA	ND	ND	<5	<0.2	7	<2	6	<5	<5	<10	65	<100	4	10	<10
IKM035P	46.7014	115.0475	0.1	0.000156	0.06	72	<0.1	6	5	23	<5	<5	<10	63	<100	<1	25	25
IKM037P	46.6044	114.8558	0.1	ND	ND	10	<0.1	6	7	34	<5	<5	<10	205	<100	1	20	58
IKM038P	46.6008	114.9050	0.1	0.000017	0.01	<5	<0.1	5	7	31	<5	<5	<10	175	<100	1	15	10
IKM039P	46.6019	114.9036	0.1	ND	ND	8	<0.1	5	6	40	<5	<5	<10	280	<100	1	15	122
IKM040P	46.5858	114.9292	0.1	ND	ND	12	<0.1	8	8	35	<5	<5	<10	228	<100	<1	15	160
IKM041P	46.5831	114.9644	0.1	0.000139	0.05	<5	<0.1	6	6	32	5	<5	<10	165	<100	<1	20	75
IKM042P	46.5831	114.9903	1	0.000041	0.02	485	<0.1	9	7	33	<5	<5	<10	190	<100	<1	15	136
IKM043P	46.6086	115.0858	0.1	0.004705	1.79	180	<0.1	7	9	36	<5	<5	35	232	<100	1	35	30
IKM044P	46.6514	115.1108	0.1	0.000365	0.14	<5	<0.1	6	7	30	<5	<5	<10	138	<100	<1	<10	80
IKM045P	46.7108	114.9614	0.1	0.000747	0.28	<5	<0.1	5	8	29	<5	<5	<10	180	<100	<1	10	165
IKM046P	46.6981	114.9367	0.1	ND	ND	<5	<0.1	6	11	35	<5	<5	<10	202	<100	<1	10	162
IKM057P	46.6633	115.0783	0.1	ND	ND	30	<0.1	3	5	22	<5	<5	<10	85	<100	<1	10	66
IKM058P	46.6653	115.0792	0.1	ND	ND	<5	<0.1	10	5	32	<5	<5	<10	172	<100	<1	10	43
IKM059P	46.6653	115.0728	0.1	ND	ND	47	<0.1	6	5	26	<5	<5	<10	130	<100	<1	10	51
IKM060P	46.6719	115.0778	0.1	ND	ND	<5	<0.1	10	3	31	<5	<5	<10	222	<100	<1	<10	38

TABLE A-4.--Analyses of alluvial sample concentrates--Continued

Sample Number	Latitude	Longitude	Volume ft^3	Au oz/yd^3 (0.001671)	Au $/$yd^3$	Au (2074) (ppb)	Ag (0.5) (ppm)	Cu (32) (ppm)	Pb (31) (ppm)	Zn (73) (ppm)	As (14) (ppm)	Sb (3) (ppm)	W (13) (ppm)	Mn (565) (ppm)	Ba (59) (ppm)	Mo (3.6) (ppm)	Hg (99) (ppb)	Ce (633) (ppm)
IKM061P	46.6814	115.0778	0.1	ND	ND	50	<0.1	12	155	32	8	<5	<10	67	<100	<1	15	70
IKM062P	46.7444	115.0617	0.1	ND	ND	<5	<0.1	9	6	16	<5	<5	<10	73	<100	<1	15	27
IKM063P	46.7450	115.0658	0.1	ND	ND	<5	<0.1	8	4	16	<5	<5	<10	132	<100	<1	<10	18
IKM064P	46.7369	115.0903	0.1	ND	ND	295	<0.1	4	4	15	<5	<5	<10	80	<100	<1	10	20
IKM065P	46.7358	115.0828	0.1	ND	ND	<5	<0.1	3	2	8	<5	<5	<10	25	<100	1	<10	42
IKM066P	46.7328	115.0797	0.1	ND	ND	215	<0.1	4	4	13	<5	<5	<10	80	<100	<1	10	105
IKM068P	46.7553	115.1608	0.1	ND	ND	<5	<0.1	3	4	15	<5	<5	<10	170	<100	<1	<10	<10
IKM069P	46.7636	115.1742	0.1	ND	ND	20	<0.1	3	4	12	<5	<5	<10	78	<100	1	<10	83
IKM070P	46.7725	115.1772	0.1	0.000052	0.02	<5	<0.1	3	5	11	<5	<5	<10	90	<100	<1	<10	350
IKM071P	46.7828	115.1794	0.05	ND	ND	<5	<0.1	2	2	12	<5	<5	<10	40	<100	<1	<10	76
IKM072P	46.7675	115.1511	0.1	ND	ND	<5	<0.1	3	3	11	<5	<5	<10	78	<100	<1	20	112
IKM073P	46.7656	115.1519	0.1	ND	ND	<5	<0.1	3	4	14	<5	<5	<10	102	<100	<1	10	73
IKM074P	46.7650	115.1517	0.1	ND	ND	<5	<0.1	3	10	18	<5	<5	<10	310	<100	<1	10	16
IKM075P	46.7506	115.1386	0.1	ND	ND	<5	<0.1	5	5	17	<5	<5	<10	253	<100	1	10	12
IKM077P	46.6800	114.8717	0.1	ND	ND	<5	<0.1	10	11	46	5	<5	<10	125	<100	<1	15	27
IKM078P	46.6950	114.9003	0.1	ND	ND	<5	<0.1	7	6	20	<5	<5	<10	138	<100	1	15	50
IKM079P	46.6964	114.9011	0.1	ND	ND	<5	<0.1	8	20	50	<5	<5	<10	210	<100	1	10	62
IKM081P	46.6756	115.0478	0.1	ND	ND	<5	<0.1	3	6	31	<5	<5	<10	255	<100	2	10	145
IKM082P	46.6767	115.0489	0.1	0.000078	0.03	<5	<0.1	6	8	32	<5	<5	<10	182	<100	<1	15	85
IKM084P	46.9586	115.0125	0.1	ND	ND	15	1.3	62	82	53	35	<5	<10	365	<100	3	15	50
IKM086P	46.9500	115.0122	0.1	ND	ND	<5	0.1	21	22	42	7	<5	<10	340	<100	1	20	38
IKM087P	46.9275	115.0142	0.1	ND	ND	<5	0.2	54	37	41	20	<5	<10	285	<100	2	15	31
IKM088P	46.9242	115.0189	0.1	ND	ND	17	1.7	145	102	42	75	<5	<10	245	<100	2	40	38
IKM089P	46.8622	114.9997	0.1	ND	ND	7	0.2	77	24	35	12	<5	<10	252	<100	1	55	26
IKM090P	46.8636	114.9992	0.1	ND	ND	<5	0.1	42	18	40	10	<5	<10	285	<100	1	15	32
IKM091P	46.8456	114.9850	0.1	ND	ND	18	0.5	130	65	40	62	<5	<10	292	<100	3	40	25
IKM092P	46.7711	115.0706	0.1	ND	ND	<5	<0.1	14	5	18	<5	<5	<10	280	<100	<1	30	22
IKM093P	46.7711	115.0717	0.1	ND	ND	8	0.1	55	16	20	5	<5	<10	335	<100	1	25	35
IKM095P	46.6917	114.8131	0.1	ND	ND	5	<0.2	5	11	54	<5	<5	<10	246	<100	2	25	50
IKM096P	46.7642	115.0911	0.1	ND	ND	335	<0.1	2	2	3	<5	<5	<10	35	<100	<1	15	50
IKM098P	46.7736	115.1314	0.1	ND	ND	<5	<0.1	9	4	34	<5	<5	<10	250	100	<1	45	20
IKM099P	46.7711	115.1319	0.1	ND	ND	5	<0.1	2	4	8	<5	<5	<10	52	<100	<1	40	95
IKM100P	46.7778	115.1458	0.1	ND	ND	<5	<0.1	4	2	8	<5	<5	<10	78	<100	<1	20	80
IKM130P	46.8731	114.7922	0.1	ND	ND	<5	<0.1	3	5	24	<5	<5	<10	150	<100	<1	45	42
IKM131P	46.8697	114.7956	0.1	ND	ND	<5	<0.1	4	4	31	<5	<5	<10	198	<100	<1	45	32
IKM132P	46.8592	114.8544	0.1	ND	ND	<5	0.4	12	4	14	5	<5	<10	83	<100	<1	30	30
IKM133P	46.8611	114.8628	0.1	ND	ND	<5	0.2	13	9	7	7	<5	<10	90	<100	<1	30	25
IKM134P	46.7158	115.2553	0.1	ND	ND	365	<0.1	6	5	12	<5	<5	<10	225	<100	<1	25	172
IKM135P	46.7192	115.2639	0.1	ND	ND	540	<0.1	6	4	9	<5	<5	<10	132	<100	<1	50	195

TABLE A-4.--Analyses of alluvial sample concentrates--Continued

Sample Number	Latitude	Longitude	Volume ft^3	Au oz/yd^3 (0.001671)	Au $/$yd^3$	Au (2074) (ppb)	Ag (0.5) (ppm)	Cu (32) (ppm)	Pb (31) (ppm)	Zn (73) (ppm)	As (14) (ppm)	Sb (3) (ppm)	W (13) (ppm)	Mn (565) (ppm)	Ba (59) (ppm)	Mo (3.6) (ppm)	Hg (99) (ppb)	Ce (633) (ppm)
IKM136P	46.7203	115.2917	0.1	ND	ND	203	<0.1	8	5	15	<5	<5	<10	180	<100	<1	20	220
IKM137P	46.7142	115.3078	0.1	ND	ND	<5	0.1	10	3	15	<5	<5	<10	103	<100	<1	45	35
IKM138P	46.6839	115.3544	0.1	ND	ND	<5	<0.1	14	5	20	<5	<5	<10	110	<100	<1	35	36
IKM139P	46.6672	115.3767	0.1	ND	ND	945	<0.1	8	3	13	<5	<5	<10	203	<100	<1	25	152
IKM140P	46.6653	115.3747	0.1	ND	ND	6	<0.1	10	6	34	<5	<5	<10	192	<100	<1	20	125
IKM141P	46.6642	115.3769	0.1	0.000330	0.13	<5	<0.1	13	5	20	<5	<5	<10	127	<100	1	30	48
IKM142P	46.6564	115.3889	0.1	ND	ND	<5	<0.1	11	4	30	<5	<5	<10	170	<100	1	30	105
IKM143P	46.6469	115.4175	0.1	0.002109	0.80	2660	<0.1	8	2	15	<5	<5	<10	118	<100	<1	40	67
IKM145P	46.8158	114.9575	0.1	ND	ND	12	0.2	60	29	50	22	<5	<10	160	<100	1	25	47
IKM148P*	46.7792	114.9256	0.1	0.053109	20.18	27500	16	73	98	32	70	<5	<10	230	<100	4	35	80
IKM151P*	46.7131	115.0878	0.1	0.011485	4.36	19800	4.3	5	20	25	7	<5	<10	158	<100	<1	20	92
IKM152P*	46.7197	115.0900	0.1	0.006676	2.54	4120	1.3	5	5	22	5	<5	<10	175	<100	<1	15	105
IKM153P*	46.7208	115.0856	0.1	0.002708	1.03	3760	0.8	6	6	9	6	<5	<10	143	<100	1	35	250
IKM154P	46.7150	115.1975	0.1	0.003924	1.49	5010	0.7	5	6	16	5	<5	<10	162	<100	<1	25	220
IKM155P	46.7181	115.2331	0.1	0.001918	0.73	3405	<0.1	5	6	15	<5	<5	<10	150	<100	2	20	178
IKM156P	46.7167	115.2353	0.1	0.001068	0.41	1875	<0.1	16	6	37	<5	<5	<10	302	<100	1	15	150
IKM157P	46.6467	115.4211	0.1	0.002682	1.02	4870	1.6	12	3	24	<5	<5	<10	180	<100	<1	45	92
IKM158P	46.6422	115.4167	0.1	0.002205	0.84	2580	0.5	5	<2	30	<5	<5	<10	188	100	2	15	35
IKM159P	46.6353	115.4319	0.1	0.003229	1.23	4860	<0.1	28	7	13	<5	<5	32	123	<100	2	15	1120
IKM160P	46.6258	115.4864	0.1	0.001563	0.59	1685	0.1	11	4	16	<5	<5	<10	138	<100	1	10	56
IKM161P	46.5939	114.8097	0.05	0.000764	0.29	1105	<0.1	4	8	33	<5	<5	<10	140	<100	<1	10	20
IKM162P	46.6011	114.8197	0.1	0.000260	0.10	375	<0.1	4	5	31	<5	<5	<10	115	<100	<1	10	25
IKM163P	46.6056	114.8142	0.1	0.000286	0.11	480	<0.1	5	7	27	8	<5	<10	157	<100	<1	25	140
IKM164P	46.6114	114.8261	0.1	0.000234	0.09	225	<0.1	9	14	38	<5	<5	<10	223	<100	<1	260	58
IKM167P	46.6056	114.8511	0.1	ND	ND	25	<0.1	11	14	26	32	<5	<10	260	<100	1	20	22
IKM168P	46.6078	114.8333	0.1	ND	ND	275	0.1	8	8	41	5	<5	<10	208	<100	<1	50	60
IKM170P	46.6347	114.8594	0.05	ND	ND	5	<0.1	6	10	38	<5	<5	<10	282	<100	<1	10	72
IKM191P	46.6850	115.3625	0.1	0.000252	0.10	210	<0.1	14	4	27	<5	<5	<10	253	<100	<1	1350	335
IKM192P	46.6875	115.3497	0.1	0.042501	16.15	13150	14	5	6	14	<5	<5	32	180	<100	<1	25	1025
IKM194P	46.6814	115.0836	0.1	0.000139	0.05	795	<0.1	13	5	26	<5	<5	<10	245	<100	<1	20	152
IKM195P	46.7556	115.0742	0.1	0.022509	8.55	14300	19	4	6	9	<5	<5	<10	105	<100	<1	225	260
IKM196P	46.7522	115.0728	0.1	ND	ND	550	<0.1	14	3	12	<5	<5	<10	112	<100	<1	65	410
IKM197P	46.6597	115.0858	0.1	0.001788	0.68	42	<0.1	7	8	33	<5	<5	<10	140	<100	2	15	110
IKM198P	46.7133	115.1858	0.1	ND	ND	58	<0.1	12	5	25	<5	<5	<10	172	<100	<1	30	145
IKM199P	46.5622	115.4453	0.1	0.002387	0.91	3130	<0.1	6	2	15	<5	<5	33	125	<100	1	15	190
IKM200P	46.5558	115.4353	0.1	ND	ND	210	<0.1	8	3	20	<5	<5	<10	160	<100	<1	15	325
IKM207P	46.7656	114.7992	0.1	ND	ND	50	<0.1	12	<2	8	6	<5	<10	122	<100	<1	10	40
IKM208P	46.7531	114.7972	0.1	ND	ND	165	<0.1	9	<2	9	5	<5	<10	90	<100	<1	15	38
IKM209P	46.8686	114.7438	0.05	ND	ND	22	<0.1	11	11	30	6	<5	<10	595	<100	2	10	35

TABLE A-4.--Analyses of alluvial sample concentrates--Continued

Sample Number	Latitude	Longitude	Volume ft^3	Au oz/yd^3 (0.001671)	Au $/$yd^3$	Au (2074) (ppb)	Ag (0.5) (ppm)	Cu (32) (ppm)	Pb (31) (ppm)	Zn (73) (ppm)	As (14) (ppm)	Sb (3) (ppm)	W (13) (ppm)	Mn (565) (ppm)	Ba (59) (ppm)	Mo (3.6) (ppm)	Hg (99) (ppb)	Ce (633) (ppm)
IKM213P	46.7600	114.9597	0.1	ND	ND	2300	0.8	62	40	24	75	<5	<10	166	<100	1	20	65
IKM214P	46.7531	114.9744	0.1	0.001589	0.60	905	0.4	46	28	18	40	<5	<10	105	<100	1	15	142
IKM215P	46.7486	114.9947	0.1	ND	ND	2500	0.2	16	6	15	10	<5	<10	82	<100	<1	20	165
IKM216P	46.6772	114.9478	0.1	0.001250	0.48	810	6.7	3	9	15	12	<5	<10	106	<100	<1	10	510
IKM217P	46.7453	115.1106	0.1	0.000573	0.22	1150	<0.1	6	4	16	<5	<5	<10	225	<100	<1	15	245
IKM235P	46.7308	115.0778	0.1	0.000278	0.11	1125	0.3	6	18	12	5	<5	<10	196	<100	<1	20	260
IKM236P	46.7392	115.0778	0.1	0.000911	0.35	110	<0.1	4	4	8	<5	<5	<10	65	<100	<1	10	285
IKM237P	46.7444	115.0722	0.1	0.007231	2.75	1810	0.1	7	9	10	<5	<5	<10	163	<100	<1	65	340
IKM238P	46.8050	115.0981	0.1	0.288516	109.64	27800	1.6	9	9	12	<5	<5	<10	160	<100	<1	40	145
IKM241P	46.7131	115.0169	0.1	ND	ND	125	<0.1	5	10	8	<5	<5	<10	65	<100	<1	10	132
IKM243P	46.7222	114.9342	0.1	ND	ND	85	<0.1	6	3	20	<5	<5	<10	310	<100	1	20	170
IKM244P	46.7242	114.9383	0.1	ND	ND	150	<0.1	7	<2	17	<5	<5	<10	220	<100	2	85	95
IKM245P	46.7214	114.9558	0.1	ND	ND	60	<0.1	6	<2	20	<5	<5	<10	268	<100	<1	<10	110
IKM246P	46.7206	114.9581	0.1	ND	ND	42	<0.1	4	<2	18	<5	<5	<10	250	<100	<1	15	105
IKM247P	46.7153	114.9581	0.1	ND	ND	15	<0.1	6	<2	21	<5	<5	<10	310	<100	<1	10	108
IKM254P	46.5053	115.3911	0.1	ND	ND	103	0.1	4	7	19	<5	<5	<10	132	<100	<1	15	112
IKM255P	46.5067	115.3894	0.1	0.000590	0.22	6980	<0.1	5	5	23	<5	<5	<10	185	<100	<1	15	435
IKM256P	46.5211	115.4103	0.1	ND	ND	<5	<0.1	4	5	18	<5	<5	<10	101	<100	<1	10	210
IKM257P	46.5194	115.4128	0.1	0.002092	0.79	<5	<0.1	4	3	15	<5	<5	<10	122	<100	<1	15	365
IKM267P	46.7000	114.7906	0.1	0.000417	0.16	850	<0.2	6	43	90	5	<5	<10	472	<100	1	35	35
IKM268P	46.7125	114.8264	0.1	0.000278	0.11	53	<0.2	8	12	53	<5	<5	<10	320	<100	3	20	97
IKM269P	46.6636	114.7303	0.05	ND	ND	35	<0.2	8	34	51	8	<5	<10	592	<100	4	95	335
IKM270P	46.6450	114.7569	0.1	ND	ND	30	<0.2	6	8	55	<5	<5	<10	380	<100	2	125	320
IKM271P	46.6497	114.7161	0.1	ND	ND	<5	<0.2	3	6	33	<5	<5	<10	161	<100	1	<10	47
IKM284P	46.5919	114.8781	0.1	0.000521	0.20	60	<0.2	13	12	46	10	<5	<10	512	<100	4	105	385
IKM285P	46.5981	114.8908	0.1	ND	ND	108	<0.2	14	10	47	16	<5	<10	505	<100	2	70	350
IKM286P	46.6019	114.8933	0.1	ND	ND	20	<0.2	8	6	54	6	<5	<10	650	<100	3	<10	680
IKM287P	46.5903	114.9228	0.1	ND	ND	8	<0.2	8	8	82	8	<5	<10	327	<100	2	<10	225
IKM288P	46.5886	114.9286	0.1	ND	ND	17	<0.2	7	10	50	8	<5	<10	465	<100	2	<10	320
IKM289P	46.5869	114.9428	0.1	0.000616	0.23	25	<0.2	8	8	36	10	<5	<10	310	<100	2	<10	175
IKM290P	46.5808	114.9597	0.1	ND	ND	<5	<0.2	5	8	62	<5	<5	<10	212	<100	3	<10	20
IKM291P	46.5836	114.9794	0.1	ND	ND	18	<0.2	18	9	36	<5	<5	<10	308	<100	1	20	45
IKM292P	46.6417	115.1325	0.1	ND	ND	<5	<0.2	25	9	48	<5	<5	10	248	<100	1	425	215
IKM294P	46.6356	115.1206	0.1	ND	ND	125	<0.2	6	5	21	<5	<5	<10	112	<100	2	105	73
IKM295P	46.6267	115.1139	0.1	ND	ND	<5	<0.2	9	8	36	5	<5	<10	243	<100	3	90	185
IKM296P	46.6531	115.0914	0.1	ND	ND	<5	<0.2	7	4	32	5	<5	<10	335	<100	2	25	122
IKM299P	46.5247	115.3553	0.1	ND	ND	25	<0.2	8	3	23	<5	<5	<10	197	<100	1	15	53
IKM300P	46.5125	115.3981	0.1	ND	ND	1190	<0.2	9	6	30	<5	<5	<10	185	<100	2	85	52

TABLE A-4.--Analyses of alluvial sample concentrates--Continued

Sample Number	Latitude	Longitude	Volume ft^3	Au oz/yd^3 (0.001671)	Au $/$yd^3$	Au (2074) (ppb)	Ag (0.5) (ppm)	Cu (32) (ppm)	Pb (31) (ppm)	Zn (73) (ppm)	As (14) (ppm)	Sb (3) (ppm)	W (13) (ppm)	Mn (565) (ppm)	Ba (59) (ppm)	Mo (3.6) (ppm)	Hg (99) (ppb)	Ce (633) (ppm)
IKM301P	46.6831	114.8067	0.1	ND	ND	25	0.2	7	17	61	5	<5	<10	292	<100	3	15	43
IKM302P	46.6958	114.7031	0.1	ND	ND	<5	<0.2	3	16	38	<5	<5	<10	160	<100	1	<10	125
IKM303P	46.6864	114.6967	0.1	ND	ND	10	<0.2	8	44	76	12	<5	<10	502	<100	5	10	280
IKM304P	46.6717	114.6811	0.1	ND	ND	48	<0.2	10	68	59	10	<5	<10	720	<100	6	15	165
IKM305P	46.6725	114.6792	0.1	ND	ND	<5	<0.2	5	44	50	8	<5	<10	362	<100	4	15	125
IKM306P	46.6297	114.6953	0.1	ND	ND	5	<0.2	6	18	48	<5	10	<10	438	<100	4	10	810
IKM308P	46.7656	114.7967	0.1	ND	ND	15	<0.2	19	4	11	16	<5	<10	152	<100	1	15	82
IKM309P	46.5867	114.9494	0.1	ND	ND	18	<0.2	11	8	44	11	<5	<10	370	<100	3	10	185
IKM310P	46.5817	114.9586	0.1	ND	ND	97	<0.2	4	8	53	6	<5	<10	138	<100	2	25	22
IKM311P	46.5817	114.9689	0.1	ND	ND	28	<0.2	7	8	36	8	<5	<10	273	<100	2	15	90
IKM312P	46.5817	114.9889	0.1	0.000460	0.17	53	<0.2	8	8	34	8	<5	<10	256	<100	3	10	65
IKM313P	46.5919	115.0142	0.1	0.000347	0.13	5	<0.2	6	16	110	<5	<5	<10	705	<100	7	45	340
IKM314P	46.5908	115.0097	0.1	0.001076	0.41	20	<0.2	10	14	50	<5	<5	<10	465	<100	2	25	325
IKM315P	46.5931	115.0333	0.1	0.000286	0.11	5	<0.2	8	5	32	<5	<5	15	283	<100	2	105	148
IKM316P	46.5933	115.0347	0.1	ND	ND	<5	<0.2	5	8	55	<5	<5	<10	302	<100	2	<10	47
IKM317P	46.6008	115.0572	0.1	ND	ND	20	<0.2	10	6	36	5	<5	<10	270	<100	2	20	102
IKM318P	46.5992	115.0742	0.1	ND	ND	55	<0.2	5	6	39	<5	<5	<10	197	<100	2	<10	98
IKM319P	46.6003	115.0753	0.1	ND	ND	22	<0.2	7	7	40	<5	<5	<10	220	<100	3	20	170
IKM320P	46.5997	115.0714	0.1	ND	ND	8	<0.2	6	3	19	<5	<5	<10	167	<100	1	<10	50
IKM321P	46.6011	115.0744	0.1	ND	ND	23	<0.2	11	6	42	5	<5	<10	340	<100	4	55	195
IKM322P	46.6044	115.0747	0.1	ND	ND	<5	<0.2	12	8	50	8	<5	<10	385	<100	3	35	390
IKM323P	46.6194	115.0906	0.1	0.001658	0.63	<5	<0.2	8	7	38	<5	<5	18	270	<100	3	<10	252
IKM324P	46.6225	115.1156	0.1	0.000148	0.06	<5	<0.2	9	5	34	<5	<5	<10	247	<100	3	<10	175
IKM325P	46.7031	115.0214	0.1	0.000096	0.04	40	<0.2	6	5	34	<5	<5	<10	225	<100	1	<10	73
IKM326P	46.4797	115.2889	0.1	ND	ND	<5	<0.2	5	3	30	<5	<5	<10	280	<100	1	<10	425
IKM327P	46.4814	115.2883	0.1	ND	ND	<5	<0.2	5	5	37	<5	<5	<10	186	<100	1	290	240
IKM328P	46.4825	115.2936	0.1	ND	ND	10	<0.2	5	4	24	<5	<5	<10	208	<100	2	<10	28
IKM329P	46.4894	115.3208	0.1	ND	ND	<5	<0.2	5	3	29	<5	<5	<10	190	<100	1	<10	180
IKM330P	46.4928	115.3239	0.1	ND	ND	5	<0.2	5	4	34	<5	<5	<10	172	<100	<1	15	135
IKM331P	46.5011	115.3433	0.1	ND	ND	<5	<0.2	10	7	44	6	<5	<10	235	<100	<1	15	240
IKM332P	46.6786	115.0475	0.1	ND	ND	45	<0.2	5	3	27	8	<5	<10	193	<100	<1	10	202
IKM333P	46.6919	115.0344	0.1	ND	ND	10	<0.2	5	4	30	8	<5	<10	190	<100	1	305	90
IKM334P	46.6667	115.3328	0.1	ND	ND	18	<0.2	8	<2	34	<5	<5	<10	225	<100	1	10	57
IKM335P	46.6678	115.3356	0.1	ND	ND	<5	<0.2	10	6	36	<5	<5	<10	187	<100	<1	15	102
IKM336P	46.6603	115.3153	0.1	ND	ND	<5	<0.2	7	<2	20	<5	<5	<10	142	<100	<1	10	20
IKM337P	46.6544	115.3133	0.1	ND	ND	<5	<0.2	11	2	34	5	<5	<10	205	<100	<1	15	125
IKM338P	46.6544	115.3122	0.1	ND	ND	<5	<0.2	9	10	35	5	<5	<10	192	<100	1	15	225
IKM339P	46.6386	115.2797	0.1	ND	ND	<5	<0.2	8	4	33	<5	<5	<10	255	<100	1	60	380
IKM340P	46.6314	115.2697	0.1	ND	ND	<5	<0.2	11	3	32	5	<5	<10	302	<100	<1	10	102

TABLE A-4.--Analyses of alluvial sample concentrates--Continued

Sample Number	Latitude	Longitude	Volume ft^3	Au oz/yd^3 (0.001671)	Au $/$yd^3$	Au (2074) (ppb)	Ag (0.5) (ppm)	Cu (32) (ppm)	Pb (31) (ppm)	Zn (73) (ppm)	As (14) (ppm)	Sb (3) (ppm)	W (13) (ppm)	Mn (565) (ppm)	Ba (59) (ppm)	Mo (3.6) (ppm)	Hg (99) (ppb)	Ce (633) (ppm)
IKM341P	46.4647	115.0347	0.05	ND	ND	<5	<0.2	6	5	36	6	<5	<10	210	<100	<1	10	145
IKM343P	46.5744	115.1047	0.1	ND	ND	<5	<0.2	3	6	44	<5	<5	<10	186	<100	1	<10	230
IKM344P	46.5628	115.1103	0.1	ND	ND	<5	<0.2	7	9	62	<5	<5	<10	345	<100	2	20	235
IKM347P	46.5450	115.1031	0.1	ND	ND	<5	<0.2	4	7	52	5	<5	<10	221	<100	1	<10	87
IKM348P	46.5408	115.1144	0.1	ND	ND	<5	<0.2	4	5	46	5	<5	<10	185	<100	1	<10	48
IKM349P	46.5744	115.1194	0.1	ND	ND	5	<0.2	3	6	39	6	<5	<10	187	<100	<1	<10	130
IKM351P	46.5172	115.3664	0.1	ND	ND	70	<0.2	7	6	38	5	<5	<10	215	<100	1	<10	252
IKM352P	46.5128	115.4019	0.1	ND	ND	<5	<0.2	6	4	28	<5	<5	<10	170	<100	2	<10	107
IKM353P	46.5225	115.4061	0.1	ND	ND	<5	<0.2	10	4	28	<5	<5	<10	212	<100	1	<10	98
IKM354P	46.5286	115.4158	0.1	ND	ND	<5	<0.2	9	5	25	<5	<5	<10	208	<100	4	<10	85
IKM356P	46.5333	115.4242	0.1	ND	ND	12	<0.2	6	1	28	<5	<5	<10	410	<100	2	15	147
IKM357P	46.5383	115.4275	0.1	ND	ND	<5	<0.2	7	5	30	<5	<5	<10	312	<100	3	<10	905
IKM358P	46.5942	115.4439	0.1	ND	ND	<5	<0.2	12	9	21	<5	<5	<10	220	<100	2	<10	172
IKM359P	46.5947	115.4406	0.1	ND	ND	<5	<0.2	6	3	19	<5	<5	<10	158	<100	1	<10	235
IKM360P	46.5761	115.4450	0.1	ND	ND	<5	<0.2	8	3	26	<5	<5	<10	170	<100	2	<10	97
IKM361P	46.5797	115.4472	0.1	0.001198	0.46	625	<0.2	7	7	28	<5	<5	30	285	<100	2	20	495
IKM363P	46.6117	115.4347	0.1	ND	ND	<5	<0.2	12	4	38	<5	<5	<10	252	<100	1	<10	75
IKM366P	46.6197	115.4286	0.1	ND	ND	10	<0.2	6	8	27	<5	<5	<10	302	<100	1	<10	420
IKM375P	46.7067	115.1683	0.1	ND	ND	15	<0.2	8	7	36	<5	<5	<10	450	<100	1	20	605
IKM376P	46.7078	115.1681	0.1	0.002847	1.08	1530	0.9	6	6	27	<5	<5	10	462	<100	2	225	975
IKM377P	46.7094	115.1589	0.1	ND	ND	175	<0.2	13	6	40	<5	<5	<10	495	<100	2	10	290
IKM392P	46.4556	115.0614	0.1	ND	ND	<5	<0.2	6	4	32	<5	<5	<10	201	<100	<1	<10	172
IKM393P	46.4583	115.0336	0.1	ND	ND	<5	<0.2	4	4	33	<5	<5	<10	150	<100	<1	<10	65
IKM394P	46.4783	114.8814	0.05	ND	ND	165	<0.2	4	<2	14	<5	<5	<10	153	<100	1	30	35
IKM395P	46.4706	114.9247	0.1	ND	ND	<5	<0.2	5	<2	18	<5	<5	<10	170	<100	<1	15	33
IKM397P	46.4769	114.9833	0.1	ND	ND	10	<0.2	4	2	26	<5	<5	<10	155	<100	<1	10	25
IKM400P	46.5753	115.1314	0.1	ND	ND	<5	<0.2	3	4	33	<5	<5	<10	158	<100	1	15	97
IKM401P	46.5686	115.1417	0.1	ND	ND	<5	<0.2	3	4	35	5	<5	<10	163	<100	1	10	133
IKM402P	46.5369	115.1314	0.1	ND	ND	<5	<0.2	4	5	35	<5	<5	<10	132	<100	1	10	138
IKM403P	46.5261	115.1367	0.1	ND	ND	<5	<0.2	4	6	48	<5	<5	<10	220	<100	1	15	102
IKM407P	46.4178	115.4100	0.05	ND	ND	<5	<0.2	4	4	27	<5	<5	<10	164	<100	<1	15	175
IKM410P	46.5686	115.4572	0.1	ND	ND	8	<0.2	6	<2	15	8	<5	95	298	<100	2	10	110
IKM411P	46.5361	115.4733	0.1	0.002127	0.81	<5	<0.2	6	<2	20	5	<5	62	340	<100	2	<10	515
IKM412P	46.5361	115.4744	0.05	ND	ND	<5	<0.2	6	<2	20	<5	<5	<10	182	<100	1	10	63
IKM413P	46.5522	115.4669	0.1	ND	ND	<5	<0.2	5	<2	18	6	<5	10	203	<100	1	15	193
IKM414P	46.5531	115.4686	0.1	0.001597	0.61	305	<0.2	5	<2	18	<5	<5	280	190	<100	2	35	260
IKM416P	46.5886	115.3364	0.05	ND	ND	5	<0.2	4	4	31	5	<5	<10	142	<100	1	45	23
IKM418P	46.5428	115.2800	0.1	ND	ND	5	<0.2	18	20	100	6	<5	<10	258	<100	<1	25	90
IKM420P	46.5550	115.3289	0.1	ND	ND	5	<0.2	10	10	59	6	<5	<10	255	<100	1	20	108

TABLE A-4.--Analyses of alluvial sample concentrates--Continued

Sample Number	Latitude	Longitude	Volume ft^3	Au oz/yd^3 (0.001671)	Au $/$yd^3$	Au (2074) (ppb)	Ag (0.5) (ppm)	Cu (32) (ppm)	Pb (31) (ppm)	Zn (73) (ppm)	As (14) (ppm)	Sb (3) (ppm)	W (13) (ppm)	Mn (565) (ppm)	Ba (59) (ppm)	Mo (3.6) (ppm)	Hg (99) (ppb)	Ce (633) (ppm)
IKM422P	46.4828	115.5000	0.1	ND	ND	45	0.2	9	8	26	<5	<5	<10	150	<100	3	30	590
IKM423P	46.4825	115.4997	0.1	ND	ND	<5	<0.2	32	5	16	<5	<5	<10	126	<100	2	25	385
IKM424P	46.4844	115.4964	0.1	ND	ND	5	<0.2	5	4	18	<5	<5	<10	118	<100	2	25	162
IKM425P	46.4800	115.4783	0.1	ND	ND	20	<0.2	4	5	16	<5	<5	<10	120	<100	1	30	75
IKM430P	46.4486	115.6403	0.1	ND	ND	155	2.8	77	6	14	<5	<5	<10	162	<100	2	35	1125
IKM431P	46.4492	115.6389	0.1	ND	ND	<5	<0.2	22	4	12	<5	<5	<10	133	<100	1	25	128
IKM434P	46.5075	115.5353	0.1	ND	ND	25	<0.2	11	2	16	<5	<5	<10	225	<100	3	30	340
IKM437P	46.5983	115.5325	0.1	ND	ND	5	<0.2	9	6	17	6	<5	10	460	<100	1	25	425
IKM438P	46.6025	115.5100	0.1	ND	ND	<5	<0.2	10	5	18	<5	<5	<10	182	<100	1	35	72
IKM439P	46.6025	115.5114	0.1	ND	ND	1850	0.2	8	5	22	<5	<5	<10	158	<100	1	25	125
IKM440P	46.6119	115.5089	0.1	0.001754	0.67	<5	<0.2	10	5	19	<5	<5	<10	465	<100	1	35	215
IKM441P	46.6475	115.4133	0.1	ND	ND	18	0.2	11	8	29	<5	<5	10	237	<100	1	40	57
IKM442P	46.6631	115.3806	0.1	ND	ND	13	<0.2	8	5	34	<5	<5	<10	165	<100	1	25	65
IKM443P	46.6850	115.3656	0.1	ND	ND	5	<0.2	6	9	42	<5	<5	<10	220	<100	1	25	73
IKM444P	46.6856	115.3522	0.1	ND	ND	8	<0.2	11	4	35	<5	<5	<10	163	<100	1	15	75
IKM445P	46.7003	115.3303	0.1	ND	ND	20	<0.2	6	4	13	<5	<5	<10	92	<100	<1	10	87
IKM446P	46.7086	115.3183	0.1	ND	ND	<5	<0.2	6	5	15	<5	<5	<10	110	<100	<1	15	46
IKM447P	46.6894	115.3369	0.1	ND	ND	25	<0.2	6	5	17	<5	<5	<10	128	<100	1	30	98
IKM448P	46.6778	115.3708	0.1	ND	ND	<5	<0.2	6	5	16	<5	<5	<10	125	<100	1	10	53
IKM449P	46.6539	115.3989	0.1	ND	ND	105	<0.2	5	5	15	<5	<5	<10	108	<100	1	<10	48
IKM450P	46.6472	115.4117	0.1	ND	ND	<5	<0.2	7	6	20	<5	<5	<10	123	<100	1	10	20
IKM451P	46.6767	115.3367	0.1	ND	ND	12	<0.2	5	4	30	<5	<5	<10	185	110	1	20	35
IKM453P	46.6336	115.4583	0.1	ND	ND	525	<0.2	5	5	12	<5	<5	<10	128	<100	1	<10	212
IKM454P	46.6406	115.4381	0.1	0.014167	5.38	3520	<0.2	4	6	14	<5	<5	12	132	<100	1	10	215
IKM455P	46.7264	115.2494	0.1	ND	ND	165	<0.2	9	5	14	<5	<5	<10	153	<100	1	10	32
IKM456P	46.7478	115.2364	0.1	ND	ND	10	<0.2	11	5	16	<5	<5	<10	201	<100	1	<10	35
IKM457P	46.7700	115.2253	0.1	0.002570	0.98	205	<0.2	7	6	11	<5	<5	<10	145	<100	<1	<10	38
IKM458P	46.7850	115.2167	0.1	0.003299	1.25	650	<0.2	9	15	13	<5	<5	<10	302	<100	2	10	70
IKM459P	46.8075	115.2050	0.1	ND	ND	182	<0.2	9	5	12	<5	<5	<10	121	<100	1	10	25
IKM460P	46.8075	115.2050	0.1	ND	ND	<5	<0.2	9	4	14	<5	<5	<10	112	<100	1	10	63
IKM461P	46.8142	115.1978	0.1	ND	ND	<5	<0.2	7	6	12	<5	<5	<10	82	<100	1	10	40
IKM462P	46.8142	115.1978	0.1	ND	ND	<5	<0.2	14	4	14	<5	<5	<10	545	<100	2	15	38
IKM463P	46.7192	115.1814	0.1	ND	ND	<5	<0.2	10	6	25	<5	<5	<10	156	<100	1	10	45
IKM464P	46.7089	115.1708	0.1	ND	ND	<5	<0.2	14	6	27	<5	<5	<10	160	<100	1	<10	56
IKM465P	46.7153	115.1433	0.1	ND	ND	<5	<0.2	8	6	20	<5	<5	<10	160	<100	1	<10	88
IKM466P	46.7206	115.1275	0.1	ND	ND	<5	<0.2	13	5	22	<5	<5	<10	182	<100	1	<10	40
IKM467P	46.7056	115.0961	0.1	ND	ND	<5	<0.2	6	14	19	<5	<5	<10	133	<100	1	<10	35
IKM468P	46.7175	115.0528	0.1	ND	ND	<5	<0.2	11	8	22	<5	<5	<10	160	<100	1	20	50
IKM469P	46.7211	115.0611	0.1	ND	ND	12	<0.2	7	6	21	<5	<5	<10	157	<100	1	10	73
IKM471P	46.7197	115.0831	0.1	ND	ND	<5	<0.2	6	7	24	5	<5	<10	162	<100	1	10	75

TABLE A-4.--Analyses of alluvial sample concentrates--Continued

Sample Number	Latitude	Longitude	Volume ft^3	Au oz/yd^3 (0.001671)	Au $/$yd^3$	Au (2074) (ppb)	Ag (0.5) (ppm)	Cu (32) (ppm)	Pb (31) (ppm)	Zn (73) (ppm)	As (14) (ppm)	Sb (3) (ppm)	W (13) (ppm)	Mn (565) (ppm)	Ba (59) (ppm)	Mo (3.6) (ppm)	Hg (99) (ppb)	Ce (633) (ppm)
IKM472P	46.8861	115.0567	0.1	ND	ND	<5	0.9	72	26	27	37	<5	<10	203	<100	3	40	30
IKM473P	46.8864	115.0572	0.1	ND	ND	<5	<0.2	24	13	31	22	<5	<10	201	<100	2	10	43
IKM474P	46.8222	115.1939	0.1	ND	ND	<5	<0.2	6	4	8	<5	<5	<10	68	<100	1	<10	98
IKM475P	46.8181	115.1986	0.1	ND	ND	8	<0.2	15	5	13	<5	<5	<10	70	<100	1	10	70
IKM476P	46.6572	115.0389	0.1	ND	ND	10	<0.2	32	7	51	8	<5	<10	210	<100	1	10	80
IKM489P	46.5881	114.7194	0.1	ND	ND	<5	<0.2	6	12	18	11	<5	<10	325	<100	2	<10	32
IKM500P	46.6322	115.5047	0.1	ND	ND	<5	<0.2	13	19	28	23	<5	<10	202	<100	1	15	53
IKM501P	46.6292	115.5058	0.1	0.002552	0.97	50	<0.2	9	9	23	10	<5	<10	120	<100	1	20	72

Table A-5.--Whole-rock analyses of selected rock samples from the vicinity of the Kelly-Cayuse study area, Shoshone, Clearwater, and Idaho Counties, Idaho; and Mineral and Missoula Counties, Montana.

[%, percent; <, less than; total Fe as Fe_2O_3; *, not determined due to interference; LOI, loss on ignition]

Sample Number	SiO_2 (%)	Al_2O_3 (%)	Fe_2O_3 (%)	MgO (%)	CaO (%)	Na_2O (%)	K_2O (%)	TiO_2 (%)	P_2O_5 (%)	MnO (%)	LOI (%)
IKM008	88.37	5.72	0.27	0.12	0.11	3.20	0.56	0.10	0.01	0.002	0.15
IKM009	86.40	7.06	0.28	0.05	0.17	3.83	0.61	0.24	<0.01	0.003	0.13
IKM020	73.82	14.35	0.61	0.11	0.46	4.32	5.35	0.05	0.01	0.006	0.45
IKM027	89.50	4.63	0.75	0.04	0.10	1.75	1.60	0.13	0.01	0.005	0.20
IKM054	97.65	0.12	0.26	0.01	0.02	0.06	0.07	<0.01	<0.01	0.003	0.15
IKM080	98.10	0.09	0.30	<0.01	<0.01	<0.01	0.32	<0.01	0.01	0.004	0.07
IKM097	41.25	16.28	17.45	11.32	2.58	0.72	7.03	2.05	0.10	0.22	1.05
IKM108	97.50	0.12	0.36	<0.01	<0.01	0.65	0.62	<0.01	<0.01	0.005	0.15
IKM172	12.80	1.48	65.10	8.45	3.21	<0.01	0.30	0.13	*	5.32	3.02
IKM174	6.12	0.50	63.85	6.02	5.78	<0.01	<0.01	0.02	*	0.45	15.40
IKM177	3.05	0.32	1.32	22.30	33.15	<0.01	0.12	0.01	0.02	0.12	39.70
IKM179	3.80	0.20	73.50	10.15	3.10	<0.01	0.05	0.01	0.03	6.80	2.95
IKM205	98.20	0.10	0.24	0.02	0.05	0.03	0.12	<0.01	0.01	0.004	0.13
IKM220	50.25	7.18	29.10	1.95	2.01	0.12	1.29	0.12	0.10	6.15	1.82
IKM265	68.45	15.78	3.28	1.73	2.91	2.78	3.06	0.32	0.14	0.059	1.41
IKM307	76.80	12.27	1.12	0.12	0.32	2.85	4.73	0.11	0.02	0.028	0.75
IKM367	49.65	10.38	10.03	12.75	0.30	1.73	0.89	1.09	0.04	0.13	1.52
IKM435	74.65	13.52	13.52	0.13	0.92	3.28	4.32	0.02	0.04	0.009	0.86
IKM480	49.78	14.75	14.75	7.12	7.05	2.48	2.02	1.66	0.43	0.12	4.52

Table A-6.--Analyses of selected samples for lanthanum, cerium, and yttrium in the vicinity of the Kelly-Cayuse study area, Shoshone, Clearwater, and Idaho Counties, Idaho; and Mineral and Missoula Counties, Montana

[NA, not analyzed; <, less than; ppm, part per million; %, percent]

Sample Number	La (ppm)	Ce (ppm)	Y (ppm)	Sample Number	La (ppm)	Ce (ppm)	Y (ppm)	Sample Number	La (ppm)	Ce (ppm)	Y (ppm)	Sample Number	La (ppm)	Ce (ppm)	Y (ppm)
IKM020	<20	<10	12	IKM144	795	2100	410	IKM188	38	93	10	IKM230	85	225	55
IKM101	<20	<10	<5	IKM146	<10	15	22	IKM189	20	55	11	IKM231	35	83	12
IKM106	23	60	6	IKM147	50	130	<5	IKM190	20	53	<5	IKM232	31	75	13
IKM107	<20	35	26	IKM149	<20	<10	35	IKM193	22	55	5	IKM233	<20	20	<5
IKM108	<20	<10	<5	IKM150	32	43	15	IKM201	<20	15	7	IKM234	<20	28	<5
IKM109	85	220	525	IKM165	650	1675	53	IKM202	25	66	19	IKM242	22	57	14
IKM110	26	65	550	IKM166	<20	30	<5	IKM203	<20	38	17	IKM249	<20	10	<5
IKM111	<20	33	995	IKM169	<20	42	<5	IKM204	25	67	18	IKM250	<20	22	5
IKM112	20	55	1180	IKM171	<20	<10	<5	IKM205	<20	18	<5	IKM251	<20	40	8
IKM113	40	108	840	IKM172	37	92	<5	IKM206	<20	<10	11	IKM252	55	145	17
IKM114	20	53	1400	IKM173	<20	<10	<5	IKM210	<20	<10	<5	IKM253	30	78	7
IKM115	7%	18%	7250	IKM174	<20	<10	<5	IKM211	<20	28	15	IKM342	NA	48	NA
IKM116	20	58	14	IKM175	<20	<10	<5	IKM212	240	625	160	IKM345	NA	62	NA
IKM117	1920	4600	258	IKM176	25	67	5	IKM218	<20	30	6	IKM346	NA	60	NA
IKM118	45	113	28	IKM177	20	46	15	IKM219	<20	28	5	IKM350	NA	95	NA
IKM119	22	54	27	IKM178	<20	25	13	IKM220	35	95	33	IKM404	NA	41	NA
IKM120	24	60	25	IKM179	92	220	8	IKM221	36	93	28	IKM405	NA	20	NA
IKM121	28	75	34	IKM180	<20	35	12	IKM222	25	65	32	IKM406	NA	46	NA
IKM123	<20	<10	<5	IKM181	24	67	<5	IKM223	23	56	28	IKM408	NA	17	NA
IKM124	<20	35	26	IKM182	62	160	48	IKM224	<20	40	16	IKM409	NA	<10	NA
IKM125	<20	18	12	IKM183	25	73	8	IKM225	<20	20	<5	IKM415	NA	27	NA
IKM126	<20	32	16	IKM184	28	75	11	IKM226	25	64	18	IKM417	NA	10	NA
IKM127	40	105	25	IKM185	27	76	12	IKM227	<20	18	8	IKM419	NA	105	NA
IKM128	22	53	28	IKM186	32	80	5	IKM228	35	83	8	IKM503	NA	30	NA
IKM129	52	135	35	IKM187	<20	28	5	IKM229	37	80	13				

EXPLANATION

Study area boundary

Ts Tertiary sediments

Tv Tertiary volcanic rocks, fine-grained intrusions, and breccias

Tg Tertiary granite

Tqs Tertiary quartz syenite

Kt Cretaceous tonalite

Kgs Cretaceous granodiorite, schist and gneiss

Kfg Cretaceous granite and granodiorite; includes foliated rocks

Ms Proterozoic and Paleozoic quartzite, siltstone, pelite, shale, marble, schist, gneiss, amphibolite, and ultramafic rocks

Geologic contact, approximate

High-angle fault, approximate; ball on down-thrown side

Low-angle fault, approximate; teeth on upper plate

Mineral site

47°00'00"

MONTANA
IDAHO

Hoodoo Pass

CLEARWATER MINE (Causey, 1992, in preparation)

SHOSHONE
CLEARWATER

BLACKLEED PROSPECT

TOM,DICK,HARRY,FIRST CHANCE,LAST CHANCE PLACER PATENTS

G. AND G. MINE

PIONEER PLACER PATENT

SAILOR GULCH PLACER PATENT

LOST CABIN CLAIMS

OSIER CREEK

LILLY PLACER PATENTS

MOOSE CREEK PLACER

RUBY CREEK

ROCK QUARRY

MAYFIELD CLAIMS

LOWER KELLY CREEK

EAST SADDLE CLAIMS

BLACK CANYON

ROCK QUARRY

BEAR WALLER

SAND AND GRAVEL

FOURTH OF JULY CREEK

CAYUSE CREEK

OROGRANDE CREEK

MICA GROUP

WEITAS CREEK

MAGARY CAMP AREA

BUNGALOW

PLUTON

HORSESHOE

MARTEN HILL

LAKE

CLEARWATER COUNTY
IDAHO COUNTY

FAULT

North Fork Clearwater River

Kelly Creek

Long Creek

Independence Creek

Moose Creek

Swamp Creek

Little Osier Creek

Overturned Black Canyon

Johnny Creek

Fourth of July Creek

Monroe Creek

Cayuse Creek

Toboggan Creek

Orogrande Creek

Lake Creek

15°00'00"

CK QUARRY

Ms

COUNTY

COUNTY

114°52'30"

46°52'30"

N

0 1 2 3 4 5 MILES

Scale: 1:100,000

MONTANA

IDAHO

Ms

Ms

Ms

LOST MINE PROSPECT

Ms

SNOWBIRD MINE

Ms

Ms

Ms

MINNIE MAE

Ms

Ms

North Fork Kelly Creek

LUCKY ANN/ LUCKY JO CLAIMS

Middle Fork Kelly Cr

Ms

Ms

Tqs

Tv

Tv

MINERAL COUNTY

MISSOULA COUNTY

Tg

Tg

Tg

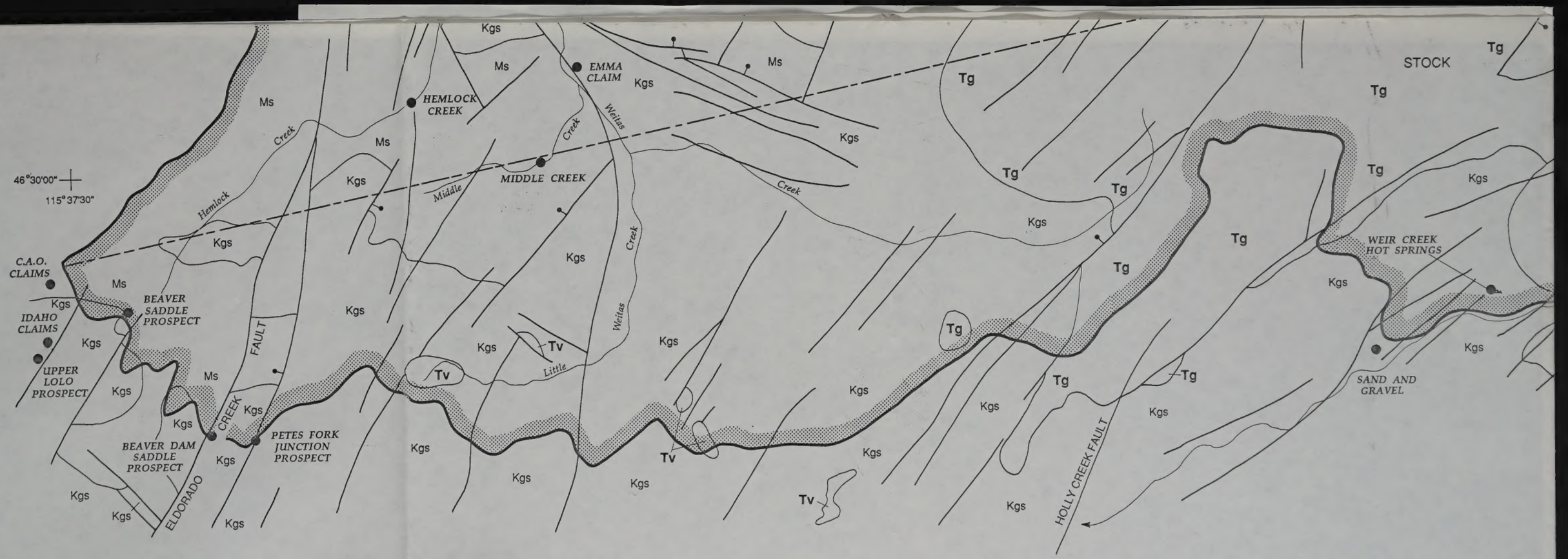
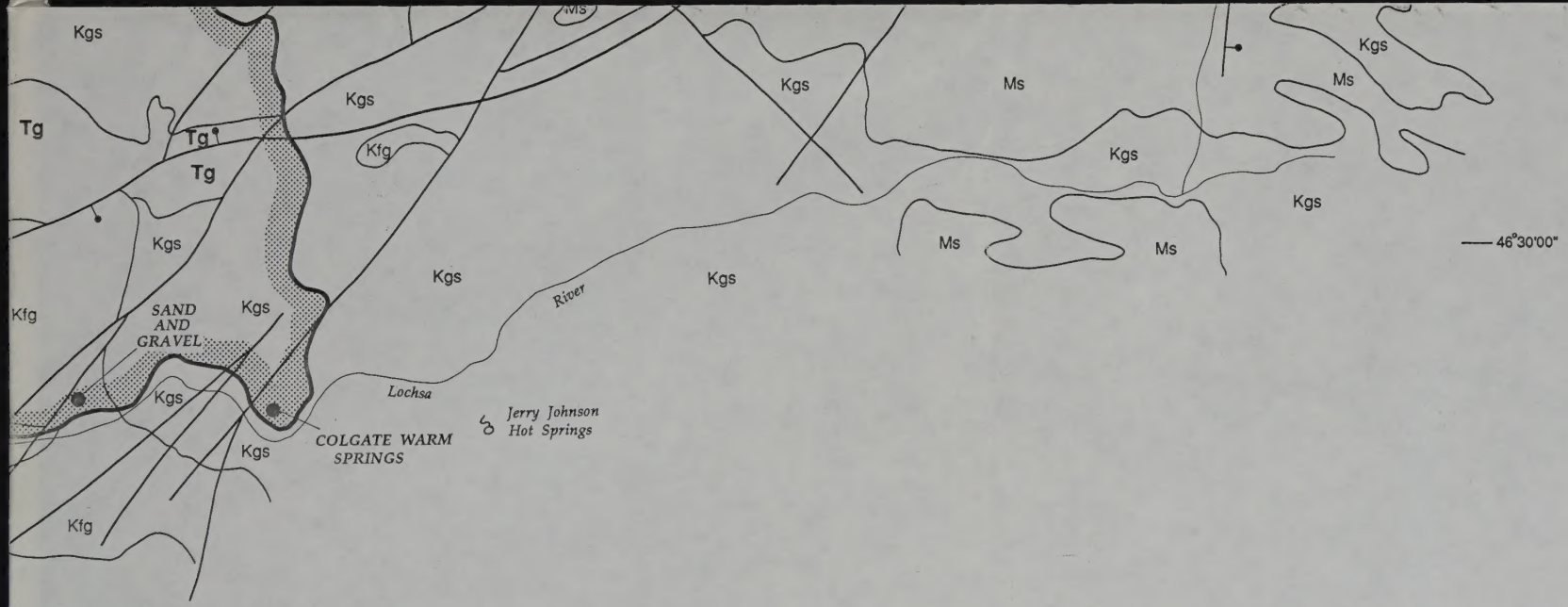


Plate 2.- Geology and mineral sites in and near the Kelly-Cayuse study area, Shoshone, Clearw
(After Lewis, Burmester, McFadden, and others, 1992, and Lewis

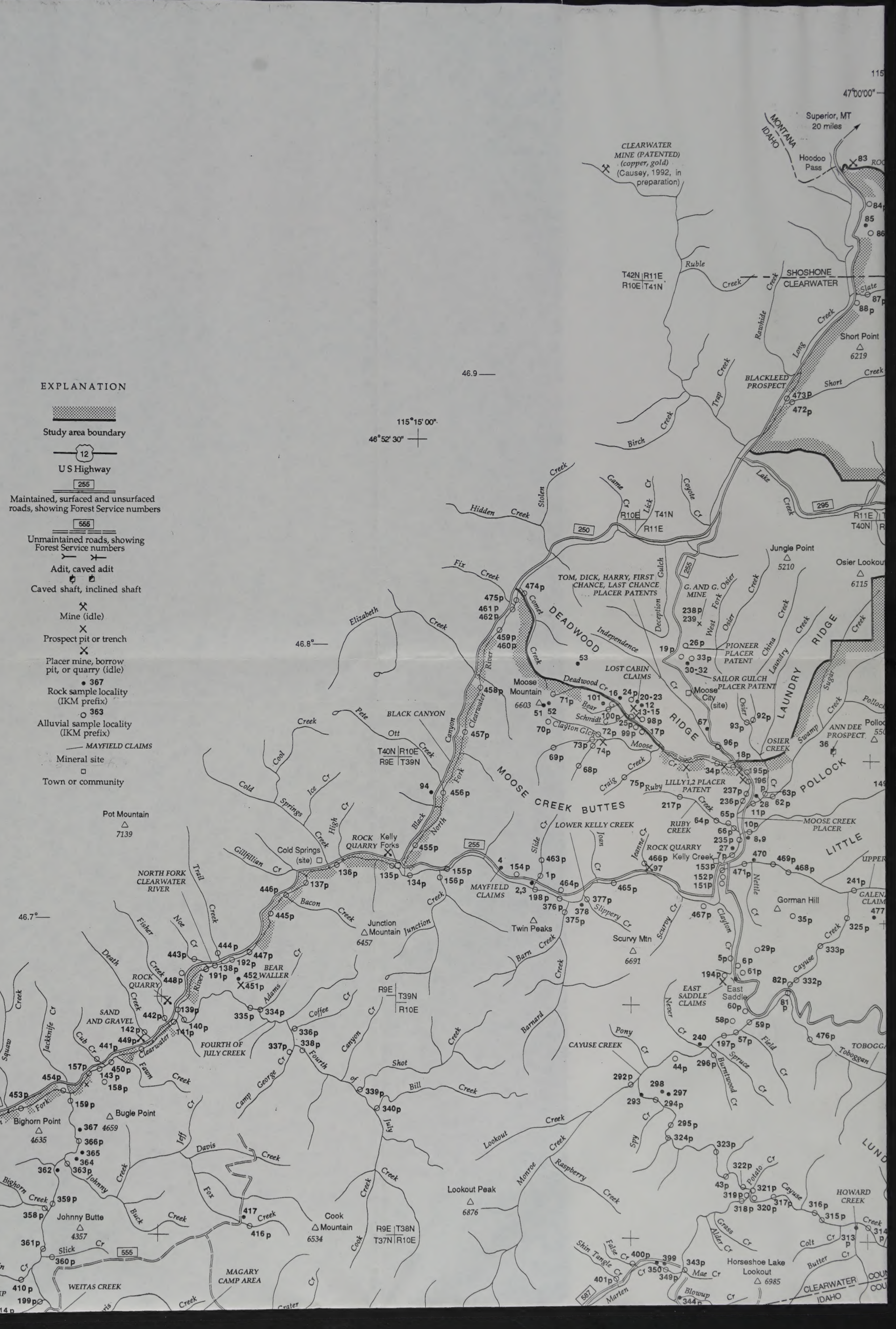


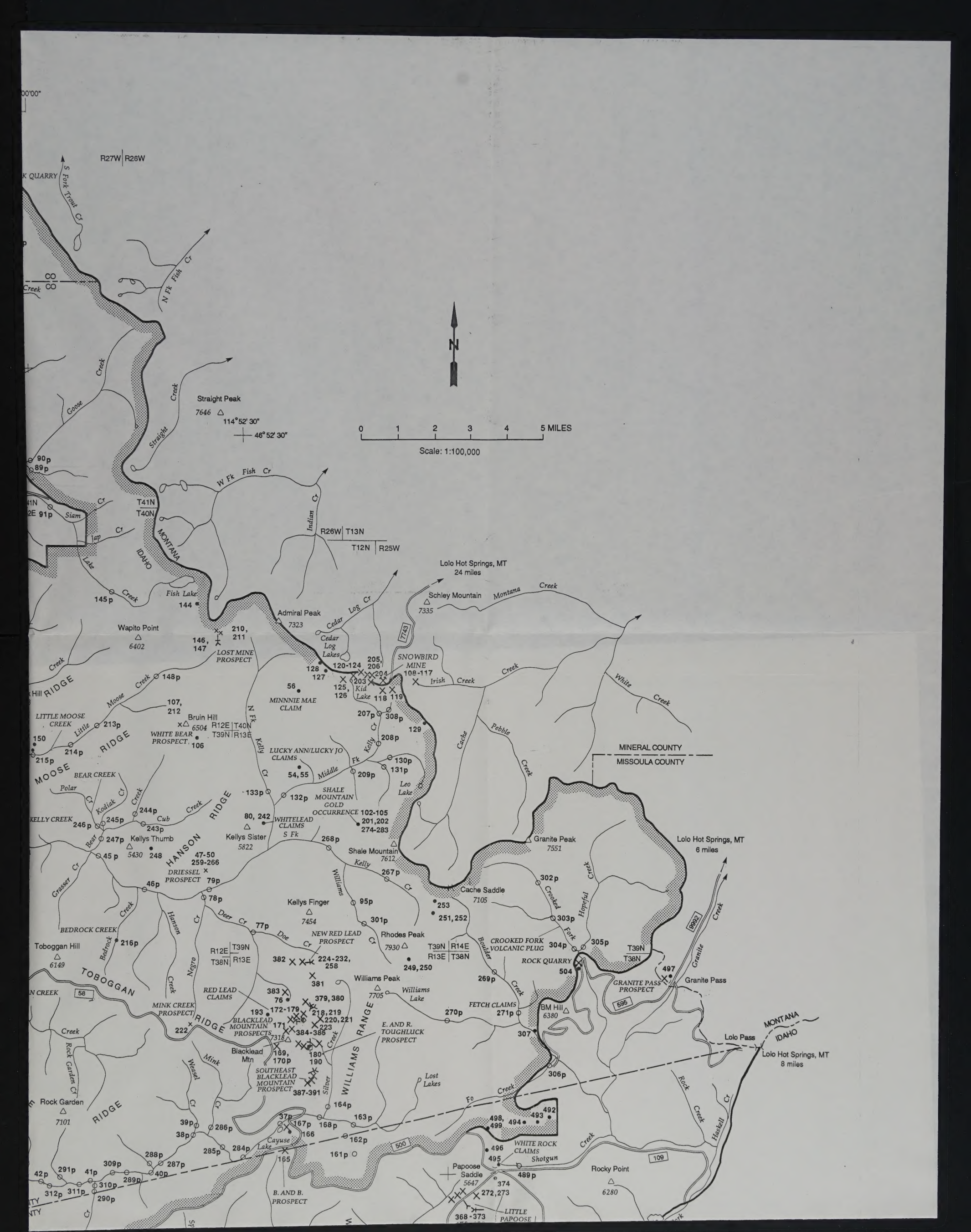
vater, and Idaho Counties, Idaho; and Mineral and Missoula Counties, Montana
Burmester, Reynolds, and others, 1992)

MINERAL SITES IN THE KELLY-CAYUSE STUDY AREA VICINITY

[Au, gold; Ag, silver; Cu, copper; Sb, antimony; F, fluorine; W, tungsten; Si, silicon; REE, rare-earth elements; GE, geothermal energy; G, garnet; QC, quartz crystal; (L), lode; (P), placer]

Name	Commodity	Latitude	Longitude
Ann Dee prospect	Au (L)	46.76	115.03
Bear Creek	Au (P)	46.72	114.96
Bear Waller	Au (P)	46.68	115.34
Beaver Dam Saddle prospect	Au (L)	46.42	115.56
Beaver Saddle	Au (L)	46.46	115.61
Bedrock Creek	Au (P)	46.68	114,95
Black Canyon	Au (P)	46.76	115.23
Blacklead Mountain prospects	Au, Cu (L)	46.65	114.84
Blackleed prospect	Au(P)	46.90	115.05
B. and B. prospect	Au (L)	46.60	114.85
C.A.O. claims	Au,Si (L)	46.47	115.63
Cayuse Creek	Au (P)	46.64	115.13
Colgate Warm Springs	GE	46.47	114.94
Crooked Fork volcanic plug	Au (L)	46.68	114.69
Driessel prospect	Au (L)	46.71	114.89
East Saddle claims	Au (P)	46.68	115.08
E. and R. Toughluck prospect	Au (L)	46.63	114.84
Emma claim	Au (L)	46.53	115.42
Fetch claims	Au (L)	46.65	114.73
Fourth of July Creek	Au (P)	46.67	115.33
Galena Claim	Au (L)	46.70	115.01
Granite Pass prospect	Au, QC (L)	46.66	114.63
Hemlock Creek	Au (P)	46.52	115.48
Howard Creek	Au (P)	46.59	115.01
Idaho claims	Au, G, REE (L)	46.45	115.64
Independence Creek patents	Au (P)	46.79	115.12
Kelly Creek, lower	Au (P)	46.71	115.17
Kelly Creek, upper	Au (P)	46.71	115.02
Lilly 1,2 patent	Au (P)	46.76	115.11
Little Moose Creek	Au (P)	46.75	114.99
Little Papoose claims	Sb, Ag, Au (L)	46.57	114.75
Lost Cabin claims	Au (L)	46.78	115.13
Lost Mine prospect	Au (L)	46.79	114.89
Lucky Ann/Lucky Jo claims	Si, Au (L)	46.74	114.85
Magary Camp area	Au (L)	46.56	115.36
Marten Hill prospect	Au (L)	46.55	115.16
Mayfield claims	Au, Cu (L)	46.71	115.18
Mica Group	Au, W (L)	46.57	115.51
Middle Creek	Au (P)	46.51	115.43
Mink Creek prospect	Au (L)	46.64	114.91
Minnie Mae claim	Au (L)	46.77	114.84
Moose Creek placer	Au (P)	46.75	115.08
New Red Lead prospect	Au, Ag (L)	46.67	114.84
North Fork Clearwater	Au (P)	46.68	115.35
Orogrande Creek	Au (P)	46.62	115.51
Osier Creek	Au (P)	46.77	115.07
Petes Fork Junction prospect	Au (L)	46.42	115.56
Pioneer patent	Au (P)	46.80	115.11
Red Lead claims	Au (L)	46.65	114.85
Rock quarry (Crooked Fork)	Rock	46.66	114.68
Rock quarry (Fisher Creek)	Rock	46.67	115.38
Rock quarry (Hoodoo)	Rock	46.98	115.02
Rock quarry (Jeanne Creek)	Rock	46.72	115.13
Rock quarry (Kelly Forks)	Rock	46.72	115.27
Ruby Creek	Au (P)	46.74	115.10
Sailor Gulch patent	Au (P)	46.79	115.11
Sand and gravel (Death Creek)		46.66	115.39
Sand and gravel (Grave Creek)		46.45	115.08
Sand and gravel (Post Office Creek)		46.47	114.98
Shale Mountain gold occurrence	Au (L)	46.72	114.81
Snowbird mine	F, REE (L)	46.78	114.79
Southeast Blacklead Mountain	Au, W	46.62	114.84
Toboggan Creek	Au (P)	46.66	115.06
Upper Lolo prospect	Au, G, REE (P)	46.45	115.64
Weir Creek Hot Springs	GE	46.46	115.04
Weitas Creek	Au (P)	46.56	115.44
White Bear prospect	Au (L)	46.76	114.91
White Rock claims	Au, Si (L)	46.59	114.73
Whitelead claims	Si, Au (L)	46.72	114.86




R27W | R26W
S Fork Trout Cr
N Fk Fish Cr
Straight Peak
7646
114°52' 30"
46° 52' 30"
N
0 1 2 3 4 5 MILES
Scale: 1:100,000
W Fk Fish Cr
Indian Cr
R26W | T13N
T12N | R25W
T41N
T40N
MONTANA
IDAHO
Lolo Hot Springs, MT
24 miles
Schley Mountain
7335
Admiral Peak
7323
Wapito Point
6402
LOST MINE PROSPECT
SNOWBIRD MINE
MINNNIE MAE CLAIM
Bruin Hill
6504
R12E | T40N
T39N | R13E
WHITE BEAR PROSPECT
LUCKY ANN/LUCKY JO CLAIMS
SHALE MOUNTAIN GOLD OCCURRENCE
WHITELEAD CLAIMS
Kellys Sister
5822
Kellys Thumb
5430
DRIESSEL PROSPECT
Shale Mountain
7612
Leo Lake
Kid Lake
Cache Saddle
7105
Granite Peak
7551
Lolo Hot Springs, MT
6 miles
MINERAL COUNTY
MISSOULA COUNTY
Kellys Finger
7454
Rhodes Peak
7930
NEW RED LEAD PROSPECT
CROOKED FORK VOLCANIC PLUG
ROCK QUARRY
GRANITE PASS PROSPECT
Granite Pass
Toboggan Hill
6149
Williams Peak
7705
Williams Lake
RED LEAD CLAIMS
MINK CREEK PROSPECT
BLACKLEAD MOUNTAIN PROSPECTS
FETCH CLAIMS
BM Hill
6380
E. AND R. TOUGHLUCK PROSPECT
Lolo Pass
Lolo Hot Springs, MT
8 miles
Blacklead Mtn
7318
SOUTHEAST BLACKLEAD MOUNTAIN PROSPECT
Rock Garden
7101
Lost Lakes
Cayuse Lake
B. AND B. PROSPECT
WHITE ROCK CLAIMS
Shotgun
Papoose Saddle
5647
LITTLE PAPOOSE
Rocky Point
6280
BEDROCK CREEK
KELLY CREEK
BEAR CREEK
LITTLE MOOSE CREEK
MOOSE RIDGE
HANSON RIDGE
TOBOGGAN RIDGE
WILLIAMS RANGE
Fish Lake
Cedar Log Lakes
Irish Creek
Pebble Creek
Montana Creek
White Creek
Granite Creek
Crooked Fork
Hopeful Creek
Rock Creek
Haskell Cr
Fo Creek
Kelly Cr
Middle Fk Kelly Cr
N Fk Kelly Cr
Williams Cr
Deer Cr
Doe Cr
Boulder Creek
Cedar Log Cr
Log Cr
Goose Creek
Straight Creek
Moose Creek
Little Creek
Bear Cr
Polar Cr
Kodiak Cr
Cub Creek
Grasser Cr
Bedrock Creek
Hanson Cr
Negro Creek
Mink Creek
Rock Garden Cr
Weasel Cr
Silver Creek
Lake Creek
Siam Cr
Jap Cr
7743
9892
58
500
595
109

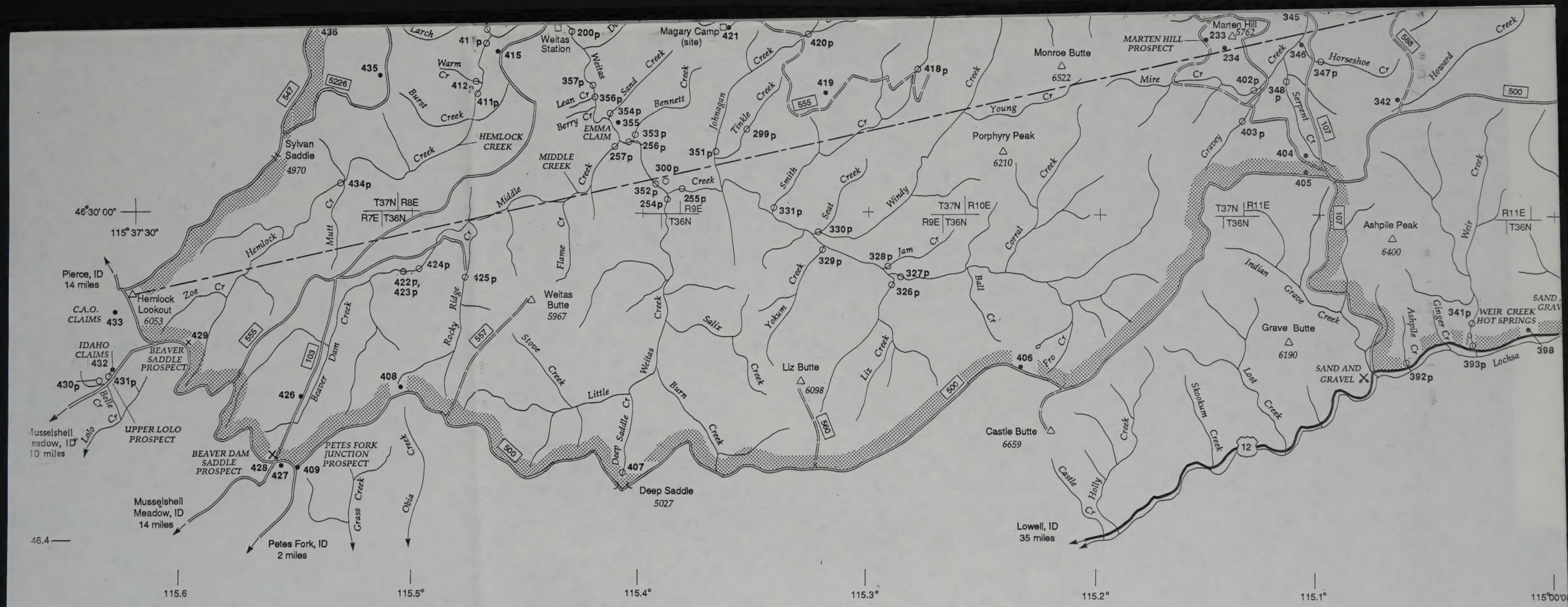
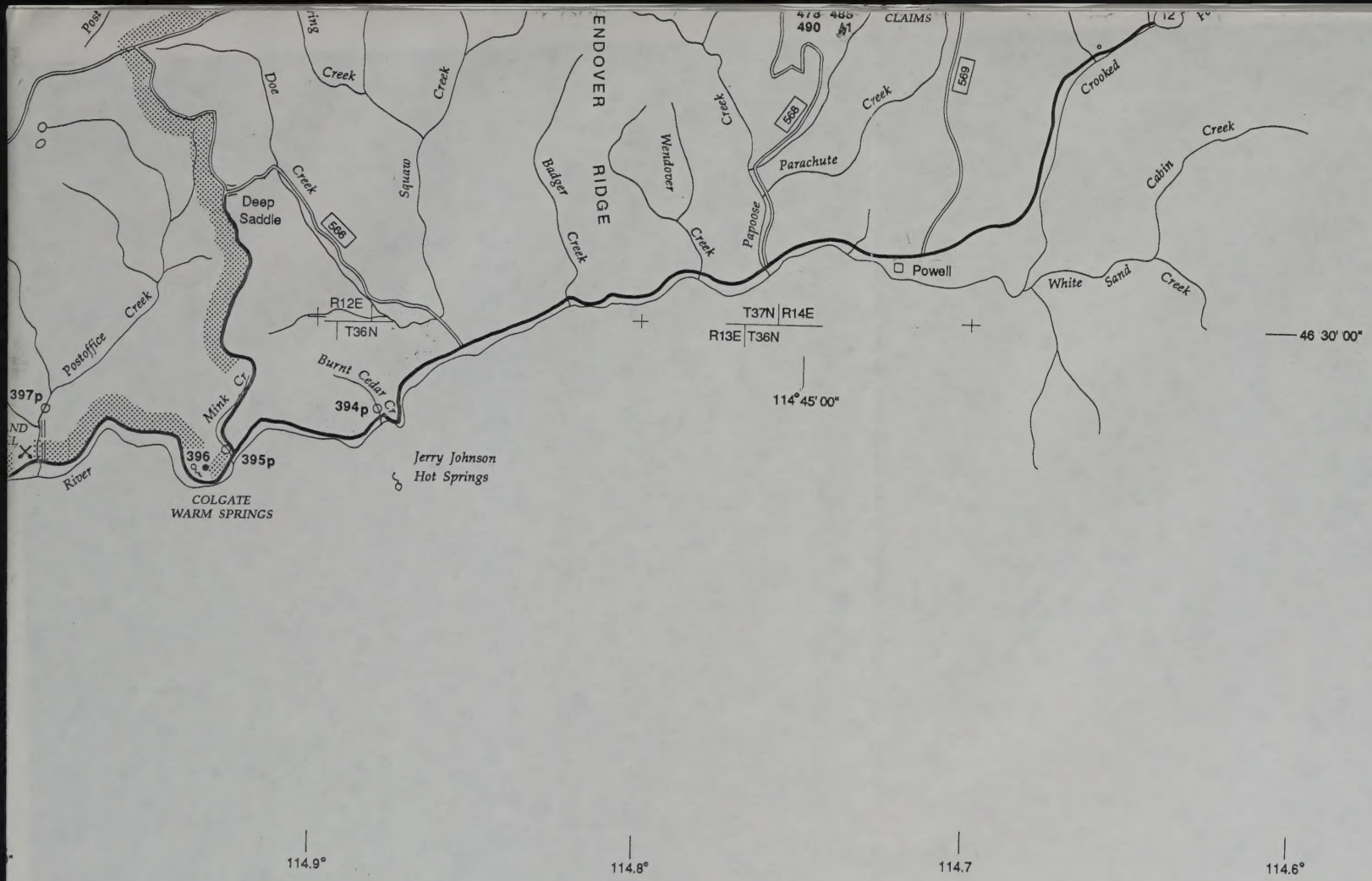


Plate 1.- Sample localities and mineral sites in and near the Kelly-Cayuse study area, Shoshone, Clearwater, and Idaho Counties, Idaho



; and Mineral and Missoula Counties, Montana